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NOTICES :—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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Looking to our Colonies

THOSE of our chemical manufacturers, engineers, and traders who look to the years ahead are, in our judgment, wise in keeping a keen eye on scientific and commercial developments in the British Colonies. Already our Colonial trade has attained a considerable volume, but immense possibilities are still ahead, and from the point of view of the future even more than of the present, time and money spent in keeping in touch with Colonial interests should prove profitable expenditure. In chemical industry more, perhaps, than in any other, this constant provision for the future is just now being specially emphasised as essential to the maintenance and extension of our position in the world's trade.

There are at least three aspects from which the opportunities offered by our Colonies should appeal to all concerned in chemical industry. The first is the ability of our Colonies to absorb home-manufactured products. As their populations grow, as they must do, their consumptive capacity increases, and their markets become more and more valuable. Evidence has recently been adduced to show that Colonial firms are strongly disposed at present to deal with the mother country, rather than with competitive nations, and the time is favourable for encouraging this tendency by producing the goods they want, and seeing that the conditions of business are made as easy and attractive as possible. Inter-colonial trade is, of course, bound to be reciprocal. The more we export to the Colonies, the more we shall take in return; where manufactured goods are bought from us, in return we shall be drawing on the Colonies for their vast stores of raw materials, and an interdependence will thus be developed to the equal advantage of both sides.

One of the most important points for the chemical engineer and plant manufacturer is the development of native industries in the Colonies. Not only does this open a large field for the works chemist, but it means a demand for chemical plant and for the services of the chemical engineer. Two examples may be taken from Canada. One is the decision of Courtauld's to establish a plant near Quebec City for the manufacture of artificial silk yarn. Another is the proposal to develop the production of arsenic in Canada from the valuable deposits of arsenical ores. One could go through all our Colonies and similarly find natural resources of almost unlimited extent waiting to be developed. In all these developments, which must come in time, the chemist, the chemical engineer, and the chemical plant manufacturer will be indispensable factors. For these and many other reasons that might be named, the openings presented by our Colonies should be ever before the leaders of British chemical industry, and the increasing tendency to pay reciprocal visits is one to be commended from every point of view.

Success with the Barium Process

THOSE who have read Mr. Kenneth M. Chance's remarks at the annual meeting of the British Cyanides Company will at least have an admiration for his pertinacity in bringing to a successful stage a process for nitrogen fixation which has, when applied on a commercial scale, baffled chemists for more than sixty years. In industrial circles it has been no secret that Mr. Chance's company has for some time been engaged in an investigation on a considerable scale in connection with the barium process for the fixation of atmospheric nitrogen, and the many unsuccessful attempts which have been made to develop this process commercially rather led to a general impression that the latest workers would not succeed where others had so often failed. The cyanides industry, however, is one which finds its existence dependent upon raw materials, the supply of which is precarious, and there can be no question that once such materials are available in unrestricted quantities the whole business must find itself on very much firmer foundations and independent of the conditions prevailing in associated industries.

For this reason the cost of research would amply justify itself even if it had proved ineffectual. Success, however, has been achieved, and when one considers the number of chemists both here and abroad who have wrestled with the process, we may at least look upon the whole matter as a triumph of perseverance and technical resource.

Mr. Chance did not attempt to give his audience much in the way of details, neither did he express any opinion as to the likely effect of the new process on the price of the products his company manufactures or on its influence on the present supplies of raw materials. Many of our readers may, in fact, have little knowledge of the *rationale* of the barium cyanide process as ordinarily understood, and for this reason a brief description will not be out of place. It has been known for nearly a century that when nitrogen is led over a mixture of potassium carbonate and carbon at high temperatures potassium cyanide is formed, and later it was found that barium carbonate gave better results, barium cyanide being formed. We are, perhaps, more familiar with the processes which take advantage of the fact that when alkali or alkaline earth bases are heated in air with carbon, cyanides are produced, and within recent years we have seen the development of the memorable work of Bucher, who employs a mixture of soda ash, powdered iron, and powdered coke. When barium is utilised in lieu of sodium compounds the behaviour of the reagents is somewhat different, for a carbide is first formed which then takes up nitrogen to yield a mixture of cyanide and cyanimide, the last named ultimately combining with a further quantity of carbon to form cyanide. The use of the process is by no means new in this country, and we believe we are right in stating that the Scottish Cyanides Company employed it for some years in the early part of this century; but that commercially it was not really successful, mainly, perhaps, owing to the inability of the plant to withstand the severe working conditions for any length of time. It will be recollected that with the Bucher process it was plant difficulties which proved the stumbling block in the early days, and when one considers Mr. Chance's success one is almost forced to the conclusion that here, perhaps, is a triumph for the chemical engineer rather than for the chemist *per se*. Obviously, however, in an instance such as this, it is not always expedient for the inventors to make public their details for general consumption, but all will join in wishing Mr. Chance, when his large-scale unit is completed, a successful materialisation of the hopes he expressed.

Technical Training and Salesmanship

The courses of lectures on chemical training and salesmanship, recently instituted in New York and Philadelphia, have already produced useful results in a series of essays submitted by students who attended the courses. In these the subject is treated from various points of view, but there is universal agreement that the chemically trained man has a material advantage over the one who is merely equipped with the instinct for selling anything. One of the writers puts the case clearly by contrasting what happens to two types of salesmen. In the case of A, the technically qualified man, when he has to deal with complaints, his knowledge not only of his own product but of its chemistry in relation to other products, helps him to understand and explain the difficulties. He holds his customers, because he is able to be of real service to them as an adviser, whereas B, the non-qualified type, has no real means of dealing with technical difficulties, and complaints often end in loss of custom. Moreover, when the bigger opening comes, A stands much the better chance of securing it.

Another writer puts the idea of "service" which is so common in American business life, in a way worth recalling. "To-day," he says, "we sell not merely an article of merchandise but we sell a 'service.' The chemical knowledge possessed by the salesman does not add one cent to the intrinsic value of the product sold by him, yet that knowledge can and often does enable him to command a considerably higher price for his brand of chemical than is obtainable by the salesman for a competing brand of equal worth. The thing to be remembered is that, if at all possible, the manufacturer of to-day should follow his product into the hands of the purchaser and endeavour so to guide that purchaser's use of the product as to ensure the maximum possibilities inherent in it as turned out of the manufacturer's plant." A third opinion is that "a knowledge of chemistry helps a salesman to understand his wares and enables him to make his own comparisons with other firm's products as an aid to selling. When new products are put out, he can tell immediately their value as compared with the old ones, or can sometimes suggest new uses for certain lines. Many a salesman's suggestions in this way have proved very valuable to his firm and greatly increased his selling power. Although one can sell chemicals without a knowledge of chemistry, the seller is not likely to develop into such a valuable salesman to his employer as the man who understands his wares from the ground up."

These are casual quotations taken from a group of essays by students mainly young, and they indicate the serious spirit on which the chemical salesmen of the future in a country whose chemical rivalry must be reckoned with regard their vocation. It is this spirit of enterprise and effort, allied with freedom from hampering conventions and traditions, which has enabled America to do big things in so many ways. Success goes in the long run to the systematically trained nation, in preference to the untrained or only casually trained, and in our competition with America and other nations for neutral markets the quality of our salesmanship may be a vital factor. For this reason the heads of our great chemical firms and the leaders of organisations responsible for the future of British chemical industry would do well to note what is being done by competitors of other nations.

New Uses for Nickel

If an instance were required of the manner in which the applications of a staple material are always undergoing change and development, the recent speech of Sir Alfred Mond at the general meeting of the Mond

Nickel Company would supply it. In the case of nickel there is to be found an extraordinary reversal of the position as it stood before the war, for whereas in those days some 50 per cent. of the whole output was utilised by steelmakers for armament purposes, to-day only about one-eighth of the whole goes into steel production, the remainder being absorbed in the manufacture of non-ferrous alloys and pure nickel articles. Nickel for coinage has, of course, been in use for many years; but, apart from the place which it now seems likely to take in the ordinary household in the way of cooking utensils, it has engaged the attention of the Association of British Chemical Manufacturers who have reported on its applicability in the construction of chemical plant. Again, the motor car industry seems definitely to have formed the opinion that nickel is immensely superior to brass, and Sir Alfred Mond ventured to predict that its use would spread until eventually it might be employed for building the entire body of cars. In addition, there would seem to be a great field for development in the manufacture of resistance wires in the electrical trades. The non-corrosive properties of nickel are, of course, well known, and the interesting announcement was made that a new alloy, "Corronil," which contains a large proportion of nickel and has high corrosion-yielding properties, is now being put on the market.

One expected, perhaps, that Sir Alfred would, in the course of his speech, have made some reference to the experiments which his firm is known to have undertaken in connection with the coating of steel ingots with nickel and the subsequent rolling of these into nickelled plates. It was at one time considered that plates of the kind might in many instances be employed in lieu of tin plates, although the use of the latter has become so well established for certain purposes, and in particular in the canning trade, that they would be displaced only with great difficulty. The nickel industry, however, seems to be thriving on its many other new applications, and this probably is a development which can be allowed to rest until the need for new markets begins to make itself felt.

The Pharmacists' Jubilee

THE jubilee meetings of the British Pharmaceutical Conference and the meetings of the International Pharmaceutical Federation held in London this week have attracted widespread attention. It is noteworthy, in looking through the reports of the speeches, to see how frequently the proper term "pharmacy" is now employed where "chemistry" was formerly used, and that this occurred in the cases of laymen addressing the conferences as well as in that of pharmacists themselves. The change in a popular habit is always slow, but it is clear that the efforts made to distinguish between "pharmacy" and "chemistry" are producing some effect and that the process of education may ultimately make the distinction clear to the public.

The international note was often heard in the course of the proceedings, and a closer understanding between the pharmacists of all nations cannot fail to bring advantages in many directions. The need of research, again, was repeatedly emphasised, and Lord Leverhulme's gift of a thousand pounds in preference shares, producing an annual yield of £200 for scholarships, medals, etc., sets an excellent practical example. It was to be expected that references to insulin would be frequent. The Chairman (Mr. F. W. Gamble) remarked that the discovery and isolation of insulin had given a tremendous impetus to physiological research, especially in relation to carbohydrate metabolism, and that already the additions to our knowledge had been astonishing. He strongly urged pharmacists who wish to keep in the front rank of their craft to make themselves familiar with the chemical methods now in vogue for determining the percentage of sugar in the blood and to offer their services to medical men. In spite of many difficulties the problem of large scale manufacture has been overcome and the success of British manufacturers of fine chemicals in this matter illustrates the importance of maintaining the fine chemical industry in the highest state of efficiency.

Points from Our News Pages

An article by Mr. Hartland Seymour deals with the explosive tendencies of pulverised coal (p. 82).

Captain Green, of Durban, discusses the future of alcohol as a motor fuel, dealing especially with natalite (p. 84).

Reviews are published of a number of recent chemical publications (p. 87).

Our Colonial matter includes returns of chemical and allied products in Canada, mineral production in New South Wales, chemical trade in South Africa, and the development of Empire trade (p. 90).

Dr. G. C. Clayton, M.P., and other members took part in a debate on the Dyestuffs Act in the House of Commons last week (p. 94).

At the annual meeting of the British Cyanides Co. an account was given by Mr. Kenneth Chance, of the company's plans for the fixation of atmospheric nitrogen (p. 95).

According to our London Market Report business remains quiet and export inquiry is poor (p. 103).

Our Scottish Market Report records only a moderate amount of business during the week, though numerous Continental quotations continue to be received (p. 106).

Books Received

THE VENTILATION OF PUBLIC BUILDINGS. By Robert Boyle. London: Robert Boyle & Son. Pp. 50. 6s.

NORDENHOLT'S MILLION. By J. J. CONNINGTON. London: Constable and Co., Ltd. Pp. 303. 7s. 6d.

THE DISCOVERY OF THE NATURE OF THE AIR, AND OF ITS CHANGES DURING BREATHING. By Clara M. Taylor. Pp. 84. 1s. 6d.

The Calendar

Sept.		
10-13	Institute of Metals: Annual Meeting.	Manchester.
12-19	British Association for the Advancement of Science: Ninety-first Annual Meeting.	Liverpool.

Explosive Tendencies of Pulverised Coal

By Hartland Seymour

The writer, who has had considerable experience of industrial and engineering conditions and plant in America, discusses the hazards which arise in connection with the utilisation of pulverised fuel. Attention is also drawn to the fact that little danger is involved providing that reasonable care is taken to comply with well-established precautions.

We are told that the explosion factor in the employment of pulverised coal has been almost entirely eliminated. When powdered coal is in bulk it is not especially explosively dangerous, but when raised in a cloud it is as dangerous as a nozzle discharging gas into the open air. It requires only a very small quantity of powdered coal per cubic foot of air to constitute a very highly explosive mixture. For instance, some tests carried out by the Pittsburgh Bureau of Mines showed that only 0·032 of an ounce of coal dust mixed with a cubic foot of air produced an explosive mixture when brought into contact with a naked light. All one has to do, then, is to heap a shilling with pulverised coal, place it in a box a foot cube, filled with air, and one has an explosive mixture. These figures were given to the Ohio Fire Chief's Club by Mr. L. D. Tracy, who is a coal-mining engineer of the U.S. Bureau of Mines. Some time ago, says Mr. Tracy, the Bureau of Mines demonstrated the inflammability of pulverised coal at its experimental mine. A large funnel containing pulverised coal was connected to a compressed-air line, and a short distance away a piece of burning waste was placed on a small rod and driven into the ground. The air was turned on, raising the coal dust into a cloud which was blown across the burning waste. Prompt ignition of the coal followed.

One form of coal dust which is exceedingly dangerous and to which perhaps too little attention is paid, is that coming from small heating furnaces in which pulverised coal is used as a fuel. These furnaces are comparatively small, and are used principally to heat bars and rods for forgings. They are somewhat like the old-style blacksmith forge, being generally provided with a hood over the fire for carrying away the fumes. The pulverised coal is shot under pressure, and sometimes all of it is not completely burned but goes off into the surrounding atmosphere as floating dust, which finally settles all over the platforms around the furnaces, on the beams and girders of the buildings, and any other place upon which it can lodge.

Mr. Tracey once made an investigation of a plant, in which this condition existed, and found this kind of dust all over the building. Samples were taken and analysed. Many of these samples were not much different from a poor grade of pure coal.

The Need for Inspection

A rather peculiar accident happened some time ago from dust of this kind in one of the Pittsburgh steel mills. At one point in the building an electric switch was so situated that dust could settle between the poles. One Sunday, when the mill was shut down, sufficient dust accumulated to form a short-circuit, and as a result a whole panel of the switchboard in the power house was burned out. Many accidents have occurred practically all of which were due to the dusty and unclean condition of the buildings. Some risks, however, are more or less connected with the apparatus used in pulverising the coal and delivering it to the point of consumption; and though it is true that reduction of the fire and explosion risks rests largely with those operating such plants, yet much can be done through proper inspection by well-informed authorities having proper jurisdiction. In order to get an adequate understanding of these risks and their remedies a working knowledge of the methods and machinery used in pulverised-fuel plants is necessary. A brief description of these methods and equipment therefore may be of value.

Before coal in a finely-powedered state can be used for fuel, it must be crushed, dried, powdered and conveyed to the furnace or boiler where it is to be used. Generally speaking, three distinct classes of pulverised coal equipment are in general use. These may be designated as: (*a*) The circulation system; (*b*) the indirect system; and (*c*) the unit system. The first two mentioned employ practically similar processes, varying perhaps in detail, but differing chiefly in the manner in which the pulverised coal is transported to the furnaces. In the circulating system, after the coal has been pulverised, it is fed in regulated quantities to a fan, by which it is forced in a cloud through pipelines with diameters ranging from 8 to 10 in. up to 14 or 16 in. Branch lines leading from the main line to the furnaces carry such coal as may be needed, and the surplus (which has not been drawn from the main line) is returned to a point near where it started, where a separator removes the coal dust from the air and returns it to a storage bin to be blown again through the line. In other words, this system embodies a continuous circulation of coal dust. It is somewhat analogous to a gas pipe where the fuel is drawn off as needed. Secondary air lines, independent of the main coal feed, provide the additional air at the burners necessary for proper combustion.

The indirect system transports coal, either by means of compressed air under, possibly, 50 to 90 lb. pressure, a screw conveyer, or a combination of air and screw conveyer, to bins at the furnaces. From these bins the pulverised coal drops into a small screw conveyer, by which it is either led to an air blast which carries it into the burner, or directly to the burner itself. An important feature of this method of utilising pulverised coal as contrasted with the circulating and direct systems is the entire absence of a drier to expel the moisture from the raw fuel.

Typical Driers

Two types of these driers, the directly- and indirectly-fired, are at present in use. The former type consists practically of a long shell from 3 to 5 ft. in diameter, at one end of which is a furnace and the other a stack. The hot gases pass through the centre of the shell, coming into contact with the raw coal, which is fed into the drier at the stack end. The indirectly-fired drier generally is one of two kinds. The first is the double-shell type which consists of two cylinders, one inside the other. The raw coal travels through the inner shell and the hot gases move in the opposite direction in the space between the two cylinders, after which they return through the inner shell to the exhaust stack. The other kind has an inclined single shell, the higher end of which terminates in a brick housing supporting the exhaust stack, and the lower end in a steel hood. The furnace for heating the drier is placed between the stack chamber and the hood. This furnace is provided with a large combustion chamber through which the drier shell passes. The hot gases from the combustion chamber of the furnace circulate around the outside of the drier shell.

The drier, directly and indirectly, is doubtless the cause of a large percentage of the fires and explosions which have occurred in coal-pulverising plants. On the man operating the drier is placed a great responsibility, akin to that laid on the man in charge of a battery of boilers. This is well illustrated by an explosion and fire that occurred in a large steel works. From evidence obtained at an investigation it was well established that the man tending the furnace of the drier for some reason built up an abnormally large fire, so that the coal in the drier ignited. The flame then passed into the pulveriser, where it came into contact with fine coal dust, with the result that an explosion followed, filling the entire building, killing two men and badly burning two others. One precaution that can be taken to prevent fires in buildings where powdered coal is used is to insist upon absolute cleanliness in the pulverising plant. Accumulations of dust must not be allowed. One principle that should never be forgotten is that when cleaning up such a plant coal dust should never be swept up with a broom, nor should accumulations be dislodged from window ledges, girders, boiler housings or platforms by blowing with compressed air, unless they have first been thoroughly wetted down or mixed with incombustible dust in the proportion of seven parts of rock or shale to one of coal. Another safeguard is to isolate the drier from the rest of the pulverising plant. If the former is not placed in a separate building it should at least be separated from the coal-consuming equipment by a blank masonary wall.

Pyrometers as a Guide

If a building the inside of which is covered with coal dust once starts burning the fire will spread with far greater rapidity than in a similar building that is clean. In fighting a fire of this nature care should be taken to avoid a sudden explosion or backfire from pulverised coal, possibly stored in a bin, but suddenly raised into a cloud by a sudden air draught or by falling material.

All driers should be equipped with recording pyrometers that make a continuous record of the temperature at which the drier is operated. Preferably this card should be placed in the office of some responsible official. Thermocouples should be installed at the discharge end of the drier. One of the greatest causes of fire in a drier room is the continued passage of hot gases from the furnace through the drier shell when the machine is not in operation or when the shell is not revolving and there is not a constant stream of coal passing through it. In such circumstances a certain amount of coal may quite possibly be lying in the drier shell, which, through continued contact with the hot gases, may in time become ignited. When the drier is again put in operation this hot coal will either be delivered to the pulveriser or to the dried-coal storage bin. If it goes to the pulveriser it is likely to ignite and explode the fine dust therein; if to the dried-coal storage bin, it may possibly start a fire. Such fires usually are, and wrongly, charged to spontaneous combustion. On the other hand, through continued application of heat from the furnace, gas may be generated from the coal within the drier. This may collect in the shell and explode, with disastrous results, if brought into contact with an open flame.

Though regulation of the coal-drying equipment is largely a matter for the operating official, yet an enactment by the proper authorities requiring all driers to be equipped with bypasses, in order to prevent the gases of combustion from entering the shell when these machines are not in operation, would be of great value. Next to the drier one of the most prolific sources of trouble is the large main which circulates the mixture of air and coal dust around the plant, returning the unused coal to the storage bin. Pulverised coal is driven through this line by air currents induced by a fan and having a pressure of about 8 or 9 oz. per sq. in. Fires in this line are often of a smouldering nature, but they may heat the pipe red hot. In coping with such a fire little can be done save cutting out the hot section. In any event the blowing fan should be stopped. The most important precaution of all, however, is that the entire line be inspected to see that it is absolutely free from sparks, glowing particles, or smouldering coal before the fan is again started. Otherwise there may be just enough dust lying in the bottom of the pipe-line to make an explosive mixture when it is raised into a cloud by the starting of the fan. Such a mixture will cause trouble if brought into contact with any glowing particles. For this reason, after a fire in a coal-circulating line the entire piping system should be thoroughly inspected before the fan is started.

At a manufacturing plant which had a large number of small furnaces drawing fuel from such a line, the main fan suddenly broke down and stopped running. The sudden cessation of pressure evidently permitted a back draught and drew hot particles of coal into the pipe line. Here they continued to smoulder until several hours later, when the fan was again put in operation. The air current thus started stirred up the dust which had settled to the bottom of the pipe and simultaneously fanned the smouldering coal into flame. The result was an explosion which travelled throughout the entire length of the pipe line and ended by blowing into pieces the cast-iron housing of the fan, one man being killed and two others burned. It is, perhaps, needless to say that all pipe lines carrying pulverised coal should be of metal.

Elevating and Conveying Plant

In a pulverised-coal plant all elevator systems and all screw conveyors should be dust-tight. This type of apparatus offends more, probably, than any other in the matter of throwing off fine dust. For a while this dust will remain in suspension, but it finally settles on some convenient flat surface. It is an easy matter to permit the joints to become loose and the cover to be jarred off. Coal elevators should be adequately vented to the outside air. One point should be closely watched, however, in all outside vents connecting with passages wherein pulverised coal is carried, and that is that the dust be not discharged in the open air in such manner or at such points that it may be drawn into the doors or windows or settle on the roof of some other building. Fires in storage bins have been another source of trouble to users of pulverised coal. Such bins are of two kinds, those which have a capacity of 15 tons of dried coal or thereabout and those that store pulverised coal. The latter hold from one to five tons each.

Spontaneous combustion almost undoubtedly plays a large part in the origin of these fires. Few reliable data are available concerning spontaneous combustion under the conditions found in pulverised-coal plants. We do not have, for instance, information relating to the quality of air that should be circulated through the bin or the temperature which once reached will cause the coal to heat rapidly. We know, however, a few things about the spontaneous combustion of coal under other conditions, and they may possibly hold true for pulverised coal. One is that fine coal exposes a larger surface to the air than coal of the same weight but in larger sizes. Consequently, it will take up oxygen more rapidly. Burning is, of course, no more or less than a rapid absorption of oxygen. Once coal is heated by any agency whatever to a temperature of 150 or 173 deg. F. it conserves enough of its own heat and absorbs oxygen so rapidly that the temperature of actual combustion is soon reached.

Spontaneous Combustion

Accounts of the following instances of spontaneous combustion are taken from the records of the Bureau for Safe Transportation of Explosives and other Dangerous Articles, which is affiliated with the American Railway Association.

Smoke was noticed coming from a box car loaded with pulverised coal in bulk. The side doors were opened for ventilation. At first actual fire could not be detected, but the entire load was hot, and smoke was rising from the surface of the coal. Three hours later the fire was seen coming to the surface. Efforts were made to transfer the contents of the car, but the dust and gas ignited where the men were shovelling. Finally the car was brought to a fire hydrant and a stream of water was used on the dust from time to time. It was eventually necessary to wash the entire load out of the car with a stream of water.

Another case was that of a shipment of pulverised coal in bags. When the doors of the car were opened smoke poured out in great volume. Several bags of the pulverised fuel which had ignited spontaneously were unloaded from the car and the fire extinguished. An official of a large steel company stated that trouble has been experienced from fire in its pulverised-coal bins. There was no way, so far as he knew, in which burning coal could be transported to, and deposited in, the bins. These bins were close to the heating furnaces and thus absorbed much radiant heat. However, as they were not large they probably were supposed to be emptied every 24 hours. It is a well known fact that for some reason pulverised coal will stick to the sides of a bin, and in time become so caked that it is necessary to jar the bin or use bars to loosen it. In such cases the coal fed to the furnace comes entirely from the centre of the bin. It also is a well-established fact that pulverised or even slack coal stored in close proximity to a furnace, a stream line, or a stack for exhaust gas will heat up much more quickly than it otherwise would. As the bins mentioned often caked and were close to the heating furnaces it is reasonable to assume that the coal clinging to the side walls was heated by radiation from the furnaces and in time reached a temperature high enough to cause combustion.

It is well, therefore, to place all storage and other bins containing pulverised coal as far away from furnaces, open lights, and flames as operating requirements will allow. The bins should be so situated that no radiation from furnaces, boilers and steam pipes, flues, and other heating appliances can materially raise the temperature of their contents. When practicable, bins used in connection with various furnaces should be placed outside the main building. Where this is not practicable they should be separated from the furnace by a non-combustible partition. Where a bin contains any large quantity of burning coal care must be taken to guard against one important danger when making efforts to extinguish the fire. If a stream of water is poured on red-hot coal carbon monoxide is likely to be generated, a d should the bin be located within a confined space men are quite

likely to be overcome, for carbon monoxide is the most poisonous gas of all those ordinarily encountered. A fraction of 1 per cent. is deadly when breathed. If a strong stream of water is played on a pile of powdered coal within a bin a cloud of dust may be raised, and when it comes in contact with a flame it may ignite, with serious consequences.

Dealing with Fires

Probably the quickest, safest, and most economical way to cope with a bin fire is to remove all the coal as soon as possible, and let it lie in a pile outdoors until the fire is entirely extinguished. When fires occur in driers their extinguishment requires considerable judgment. If the fire has not attained much headway it may be put out with water. If it is fierce, and the drier sheet has become red hot, however, it would hardly be well to introduce water.

All electric wires and cables in a plant using pulverised coal should, as far as possible, be carried in conduits. All switches, as far as can be arranged, should be placed on the outside of any building in which coal dust is likely to accumulate, and where they cannot be so located they should be of the oil-immersed type. The necessity for this precaution is shown in the incident mentioned above wherein a switch was short-circuited by dust and a switchboard panel was burned out. Motors that are likely to spark are a potential source of danger. Perhaps the best illustration of this peril is the explosion which occurred at the New Brancepeth colliery. The pulveriser was driven by a 25 h.p. 500-volt direct-current motor, which was enclosed but not explosion-proof. It stood on a platform about 6 ft. from the floor. A short-circuit of one of the armature coils caused severe sparking, whereby the coal dust inside the motor casing was ignited. This caused an explosion of sufficient force to blow off the sheet iron hood that covered the commutator end of the motor. The flame thus produced ignited the fine dust held in suspension within the building, the resulting flames extending 6 ft. outside the open door and for a height of 15 ft.

The U.S. Bureau of Mines and prominent English authorities have made extensive tests in order to determine whether a cloud of dust can be ignited by an electric arc or spark. For instance, when an arc was formed with a direct current of 100 volts and 100 amp. ignition was obtained in twenty cases in twenty-three trials. A motor of 5 h.p. on a 220-volt circuit ignited a dust cloud once in every ten trials, and a 10 h.p. motor on the same voltage ignited a dust cloud almost every time. Consequently motors of the non-sparking type, preferably squirrel-cage machines, are the nearest to being explosion-proof now available. All machinery should be thoroughly grounded to prevent sparks arising from static electricity.

Whenever inspections for fire risks are made around any kind of plant where there is a prevalence of dust, whether it be of coal, grain, aluminium, or in fact dust of any kind, the electrical equipment should be carefully examined and especially any device that may spark, such as motors, exposed switches and electric wiring.

Alcohol the Motor Fuel of the Future

Some Details of its Use in South Africa.

By Captain C. C. Green, A.M.I.Ae.E.

The following notes by Captain Green, of Durban, South Africa, treat the subject in three divisions: (1) *A description of the sources and manufacture of alcohol;* (2) *a tabulated comparison of the characteristics of alcohol, petrol and benzol, with deductions drawn therefrom; and* (3) *results from practical experience in the use of an alcohol mixture in the modern motor car.*

Sources and Manufacturing Processes

(1) Alcohol is already of immense importance in the commercial world for manufacturing purposes. Its sources are many and boundless. It can be made from either raw materials such as barley, maize, potatoes, etc., which contain starch, or from those containing sugar, such as sugar cane, beets, grapes, etc. In fact, it can be made from any vegetable which contains sugar or can be converted into sugar, as starch can. Its sources are boundless, because it can be grown as a crop yearly and in any quantity. The manufacture from one of the above raw materials may be interesting, and the writer will deal with the process as used in the manufacture of Natalite.

How "Natalite" is Made

Sugar molasses from the many sugar mills in Natal are used. These are mixed with water in large vats, into which is put a certain quantity of germ culture, which causes fermentation. These germs are bred in the factory in specially sterilised vats. After standing for about three days, this mixture, called the "wash," contains some 7 per cent. alcohol. The next process is to separate the alcohol from the wash, and this is done by passing the wash round the outer portion of an apparatus known as the analyser, where it is warmed. It then passes on into another apparatus—the rectifier—where steam is blown into the wash as it descends a series of trays. The steam volatises the alcohol and carries it back into the inner portion of the analyser, where the alcohol is finally distilled out.

This contains other ingredients, such as fusel oil, which are finally removed by charcoal filtration. This alcohol is in reality a mixture of 90 per cent. alcohol and 10 per cent. water, it being commercially impracticable to remove the water owing to expense. The writer notes, however, that a French professor claims to have discovered a cheap process for removing this 10 per cent. water, so enabling alcohol to be mixed with petrol. This alcohol has to be mixed with various denaturants before being allowed on the market by Excise as industrial alcohol. The denaturants used are an admixture of wood naphtha, pyridine, acetone and benzol, which render the alcohol so nauseous as to be undrinkable.

Alcohol, Petrol and Benzol

(2) The following table shows the various properties of alcohol, petrol and benzol:—

Average figures given for:	Alcohol.	Petrol.	Benzol.
Heat units per lb. in B.T.U.'s ..	11,500	18,500	17,100
Specific gravity (average) ..	·838	·75	·88
Spontaneous ignition temperature	518° C.	380° C.	435° C.
Heat required for vaporisation, calories	200	80	100
Air required for combustion per lb. fuel	8·75 lb.	15 lb.	13·5 lb.
Explosive limits	4% to 13·6%	1·1% to 53%	2·7% to 6·3%

Alcohol contains by weight 34 per cent. of oxygen, the formula being C_2H_6O, and it is readily soluble in water.

From this table interesting deductions can be made. Alcohol, it will be seen, contains per lb. considerably less heat units than either petrol or benzol. It is therefore absurd to expect exactly the same fuel consumption. Where alcohol does gain ground against petrol is in its greater specific gravity, which means that there is 8 per cent. greater weight per gallon of fuel. Also, it gives greater thermal efficiency because of its high proportion of oxygen and also because it can be used with a high compression.

The reason why alcohol will not cause an engine to "pink" like petrol does is seen in the high spontaneous ignition temperature. The high temperature of benzol also accounts for its non-pinking qualities. It is the spontaneous ignition of the charge which causes an engine to "pink."

It will be seen that alcohol requires a far greater amount of heat for complete vaporising than either petrol or benzol, and this explains why industrial alcohol alone cannot be run successfully in ordinary motor engines.

Again, it will be noted that alcohol, owing to its high oxygen content, requires much less air than either of the other two fuels. This fact accounts partly for its good thermal efficiency

in that it does not in the combustion of the charge have to heat up useless gases, which merely go out of the exhaust hot and give a heat loss.

It should be noted that alcohol has a greater explosive range than petrol or benzol. The practical result of this fact will be seen later.

It is well known that within limits the higher the compression pressure the greater the thermal efficiency. Alcohol can be successfully run with a compression pressure of even 200 lb. per square inch, as against that of 60–80 lb. per square inch when petrol is used. This, of course, is due to its high spontaneous ignition temperature.

Alcohol, when used with a high compression in a properly designed engine has given the remarkable thermal efficiency of 35 per cent., a good Diesel being 42 per cent., and the average petrol motor only 22 per cent.

The above data go to show that, given a suitable engine, with a high compression and an efficient vaporiser, alcohol can give excellent results, which would go far to outbid those given by petrol, or even benzol.

Deductions from Practical Experience

(3) The writer has had experience in the use of alcohol mixtures in Natal for the past two years, and it will be an account of this experience which will be of most interest to the average motorist. Industrial alcohol is unfit for use in present-day cars owing to the difficulty of obtaining satisfactory vaporisation. To overcome this difficulty various mixtures are made, the principal being :—

Natalite, which is a mixture of 60 per cent. alcohol and 40 per cent. ether. This ether is made by the process of boiling alcohol with sulphuric acid at a certain temperature, after which ether can be distilled out. This mixture gives a good vaporising fuel, which retains its properties over a length of time. It is the fuel the writer has done most of his running on, and is manufactured locally, so supplies are comparatively abundant.

Penrol consists of alcohol in which acetylene is dissolved to the extent of six volumes. When fresh, this gives easy starting and good pulling, but very soon the acetylene appears to be given off, leaving ordinary alcohol.

Energel is a mixture of 90 per cent. alcohol with 10 per cent. benzol. It gives extraordinary power, but for starting and slow running the mixture is not as good as Natalite.

Owing to financial difficulties, the last two are not being manufactured at the present moment.

Natalite is by far the most used and oldest fuel, and is the most satisfactory, so it is with Natalite as the alcoholic fuel that the writer gives his experience.

To use alcohol successfully account must be taken of its characteristics. Natalite most effectively removes any scale formed on the inside of copper fuel pipes by petrol—trouble with choked jets and filters was at first, therefore, experienced. The writer washed all pipes out with acid and the tank with Natalite, after which very little trouble was experienced. Copper is not acted on to any extent, though with aluminium a white deposit is formed. The latter fact militates against its use in aluminium carburettors.

The adjustment of the carburettor has to be made with the fact in mind that alcohol uses less air than petrol. The best way is to reduce the size of the choke tube, though satisfactory running can be obtained solely by increasing the size of the jet, which latter is the only means of adjustment with some carburettors.

The writer has used a Degory carburettor with great success because of the ease of tuning and fitting smaller chokes and because it gives good vaporisation. In tuning, an important feature has to be borne in mind. Alcohol, as seen from the table, has a large explosive range, and it is possible to give a very rich mixture and at the same time obtain remarkable power. One of the characteristics of alcohol is that on increasing the mixture above the one for complete combustion the power increases with it up to a certain point.

This means that the fuel mixture will be uneconomical if the carburettor is tuned for maximum power, because part of the alcohol goes out of the exhaust and is not completely burned. A heavy consumption would therefore be registered. To tune correctly, a mean must be taken between power and consumption, and this is not such a difficult process as it may seem to be. The writer has obtained excellent fuel economy with good pulling qualities with the average engine. Alcohol gives some 75 per cent. to 80 per cent. the fuel consumption of that given by petrol. But with a high compression engine, such as the Essex, 90 per cent. can be obtained with comparative ease.

It has been found that the use of a heater or muffler to the carburettor has been to advantage in helping the vaporisation of the fuel. Too much heating of the air, however, will give the natural result of a loss in power, owing to the smaller quantity of air, by weight, entering the engine. The ideal would seem to be to heat the fuel and not the air.

The ignition setting can be well advanced over that used when running on petrol, with an increase in power. This is due to the fact that alcohol burns more slowly than petrol and that it will enable the engine to stand a greater advance because of its non-pinking qualities.

Some experiments, in which some 5 per cent. to 7 per cent. water was added to the alcohol, gave good results, the engine keeping cool and clean. As regards the condition of the engine, Natalite gives practically no carbon deposit. The valves do not appear to be pitted any more—if not less—than with petrol. An engine which had run over 5,000 miles on Natalite was recently examined by the writer. Carbon deposit was no thicker than ordinary blotting paper and the valves scarcely required any grinding, their faces being almost perfect.

Suitable Oil

The writer soon came to the conclusion that it was most important to use a suitable oil. The average mineral oil, not being soluble in alcohol, appeared to carbonise more than with petrol—the cylinder walls did not appear, on examination, to be as well lubricated as they might. The only suitable vegetable oil available as a motor fuel is Wakefield's Castrol " R," and this was tried and is now exclusively used. It is soluble in alcohol, and now the cylinder walls present a perfect surface with a good oil glaze. The difference on changing over was marked, piston slap being entirely absent and compression much improved. Apart from this, the oil consumption was remarkable. The ordinary grade of mineral oil gave 660 miles to the gallon, but with Castrol " R " the average figure for the last four months' running has been 1,893 miles per gallon. Of course, it is admitted that Castrol " R " is a superb oil, but it nevertheless goes to show that a vegetable oil should be used with an alcoholic fuel. The writer has recently tuned several Essex cars to use Natalite and Castrol " R," and the resultant pulling and smoothness of running has been a revelation to their owners.

In South Africa, Natalite retails at 2s. 3d. per gallon, against 3s. 6d. per gallon for petrol. So that in spite of the lesser number of miles per gallon obtained on Natalite it is cheaper to run on ; also sweeter running, with absence of pinking, is a great advantage.

In the writer's opinion, alcohol will be increasingly used on account of its valuable characteristics, and more especially when its production costs can be brought down and its correct use better understood. With high-compression engines and efficient carburettors, petrol does not stand in comparison with alcohol. It is to be hoped that as alcohol is produced in larger quantities manufacturers will rise to the occasion and design engines more suitable to its efficient use. The sources of alcohol are boundless, coming from nature, and so, surely, with the characteristics it possesses, it can be fairly called the fuel of the future.

Hydrogen Sulphide as an Industrial Poison

An investigation of the toxicity of hydrogen sulphide has been completed by the Department of the Interior, U.S.A., at the experiment station of the Bureau of Mines, Pittsburgh, Pa. The experiments show that this gas is exceedingly poisonous, as acute poisoning can be caused by breathing air containing as little as seven-hundredths of one per cent. Dangers from the possible presence of this gas in mines and around industrial plants have not been fully appreciated, there being a relatively large number of poisoning cases which might have been avoided if the proper precautions had been taken. The gas is frequently present in small but dangerous quantities in places where sulphur may be present and exposed to chemical action, as in mines, sewers, sulphuric acid plants, refineries, gas plants and smelters.

Reviews

MODERN GAS PRODUCERS. By N. E. RAMBUSH. London: Benn Brothers, Ltd. Pp. 545. 55s.

The generation of producer gas forms the main theme of this book, a small section only being devoted to the question of its utilisation. After a few general introductory remarks, the author deals with his subject under four headings—theory, plant, working, and utilisation.

Producer gas, as is generally recognised, forms one of the cheapest fuels obtainable for many purposes, being at the same time of very wide application to various forms of combustible solids and to many industries. Such a work as Mr. Rambush's volume will therefore undoubtedly supply a long-felt want for all concerned with producer gas manufacture, while its logical discussion of the subject and its mass of data on producer gas formation cannot fail to be of the greatest value to those engaged in the design of any type of complete gasification plant.

In view of the fact that many points regarding both the theory and design of producers have in the past been the subject of considerable controversy, it is hardly to be expected that all the conclusions presented by Mr. Rambush will be accepted in their entirety by all other technical experts. The available knowledge is as yet incomplete, but the extremely logical manner in which the subject is worked out in the volume under review cannot but advance to no small extent the technology of producer practice.

An especially noteworthy feature of the book is the manner in which, at the end of each chapter, the questions dealt with, and the conclusions arrived at, are concisely recapitulated in leaded type. This should prove of the greatest assistance to the reader. L.

THE CHEMISTRY OF LEATHER MANUFACTURE. By JOHN ARTHUR WILSON. New York: The Chemical Catalog Co., U.S.A. Pp. 342. $5.00.

The enormous advance in the chemistry of leather manufacture is amply illustrated in this volume. During the past few years the chemist's views on the fundamental principles underlying leather manufacture have received many shocks and have undergone somewhat drastic changes. In this volume Mr. Wilson has dealt with these changes, and brought our present-day knowledge up-to-date. In his introduction he states that "leather chemistry is one of the most fascinating branches of industrial chemistry, and also one of the most complex"; and the author certainly bears that out in the way in which he presents his matter.

The book is written in such a way as to fascinate the reader who is interested, and he certainly deals in masterly fashion with many of the complex problems. The first chapter deals with the histology of the skin, and is probably the most comprehensive study of this subject that has yet been published. The chapter is amply illustrated by splendidly reproduced micro-photographs. These micro-photographs are probably the best in existence, and as the writer of this review has had the opportunity of seeing some of the original prints and sections, their magnificent reproduction is a matter for congratulation. This chapter alone is one that should be studied by everyone connected with the science of the leather industry. The author then deals with the various processes incidental to leather manufacture, including the chemical and physical constituents of the skin, the ionisation of acids, and he gives some most valuable tables which are bound to be very useful to those working in the industry. The effect of added salts on the swelling of gelatine and skin substance is fully dealt with, and the physical chemistry of the proteins and the structure of gelatine solutions is then treated. He brings into practical alignment the work of Loeb, Bogue, Procter and others, and shows how the various theories can be explained and applied in the swelling of hides and skins, both in the preliminary process prior to tanning, and also in the tanning itself. Micro-photographs showing the actual changes which take place during the liming, scudding and bateing of hides are most instructive.

The chapter on the Tannins is extremely welcome, as Mr. Wilson has brought the recent researches in this important branch of the industry together in comprehensive form, and includes new work carried out by himself and colleagues. Chrome tanning, and other mineral tannages, including iron, aluminium and silica tannages, are dealt with: also the use of synthetic tans.

It is impossible to deal adequately with all the special features of this volume; suffice it to say that it is a most valuable addition to the literature of the leather trade, and the author strikes out on quite a new line, dealing more thoroughly with the fundamental principles underlying the process than have been dealt with by any previous author. Anyone going through the book cannot but admire the beauty of the micro-photographs, and appreciate the many simple diagrams with which the author illustrates his various points. The book is well printed and well got up. It is a book which will be indispensable to the leather chemist and most valuable to the tanner. J. G. P.

PRINCIPLES OF CHEMICAL ENGINEERING. By WILLIAM H. WALKER, WARREN K. LEWIS and WILLIAM H. MCADAMS. New York: McGraw-Hill Book Co., Inc. Pp. 637. 25s.

The authors of this useful volume are professors of Chemical Engineering at the Massachusetts Institute of Technology, and they have rendered a service in collating, together with references to actual plant, the substance of their teaching curriculum and students' notes. Perhaps for the first time an attempt has been made to state the basic scientific principles upon which the solution of chemical engineering operations depend, and the methods of applying these principles to practice are illustrated by examples calculated to teach the student to think about them and to apply them for himself. The book contains seventeen chapters, but the subject matter may be roughly divided into five parts relating to the phenomena and laws relating to the flow of heat and fluids; fuels and combustion, crushing, grinding, separating and filtration with mathematical analysis; evaporation, humidification, cooling and distillation; and an introductory portion dealing with the elements of industrial stoichiometry.

This is pre-eminently a textbook for students and teachers, and a guide, philosopher, and friend to the designer of plant; there is none of the unnecessary "padding" in the way of descriptions of plans through which publications become unwieldy and unworthy of their title. Detailed criticism is really unnecessary and lies more within a professor's province and in the pages of more highly scientific journals. Suffice it to say that very little has been overlooked, and that chapters such as those on fuels, combustion, gas producers and the like are commendably restricted to the purpose in view. References to published literature and papers on the various subjects would have been a welcome addition. Thus, under filtration, the work of Sperry, Hatschek, and Allicott might have been drawn upon and reference made to the centrifugal separators of Gee, Sturgeon, and Sharples. The application of the fundamental principles of stoichiometry to industrial problems receives admirable treatment in the first chapter, being handled with a directness which cannot but give the reader a clear grasp of the subject. More important still, and perhaps unique, is the manner in which the difficulties arising out of industrial units of measurement are decisively removed by a peculiarly simple treatment. Having regard to the importance of this chapter, it is a pity that it should have been restricted to thirty-five pages, when a few more dealing with further examples of practical applications would have added materially to its value. Subsequent editions will no doubt include such alterations and additions as will be called for by the interchange of views and methods between teachers and institutes of chemical engineering that its contents should stimulate. The work may be confidently recommended alike to the student, teacher and designer. C. J. GOODWIN.

CHEMISTRY: INORGANIC AND ORGANIC. By CHARLES LOUDON BLOXAM. London: J. and A. Churchill. Pp. 832. 36s.

There is evidently a very considerable demand for a work in one volume dealing with the organic and inorganic side of chemistry. That the well-known volume of Bloxam's should have appeared in the eleventh edition is sufficient evidence of this. It is obvious that any work in one volume purporting to deal with the two branches of a vast science must be open to unlimited criticism, for probably no two writers would attach the same weight to any portion of the material to be dealt with. The authors, after a short introduction of some fifteen pages, divide their subject up into a number of chapters

and this division is of considerable interest. Chapter I. deals with water, including hydrogen and oxygen, and introduces the conceptions of analyses, synthesis, solutions, vapour pressures, and the like. The following chapter deals with air, nitrogen, oxygen, and carbon dioxide, and includes the properties and liquefaction of gases. The third chapter deals with acids, bases, and salts, and the ionic hypothesis, the last being dealt with very briefly. There follows a chapter on hydrogen in which occlusion, reduction, and oxidation are dealt with, and thereafter the non-metals are divided up into the usual groups. Between the non-metals and the metals there is a long chapter on general principles and physical chemistry into which an astonishing amount of information has been packed. The chemistry of the metals follows in the usual periodic groups.

The organic chemistry starts with a chapter on ultimate analyses, formulæ, and constitution, and thereafter the division is somewhat uncommon in that the classification is hydro-carbons, alcohols, aldehydes, acids, and stereo-chemistry, including melting point and specific volumes. It is interesting to find that the cyanides, both simple and complex, including the ferro- and ferri-cyanides are entirely dealt with in the organic portion. Further chapters are devoted to ammonia derivatives, phenols and quinones, carbohydrates, glucosides, proteins, and heterocyclic compounds. The index is unusually complete.

There is a good deal to be said for the adopted division of the organic portion in a work which has to be so compressed, but it is doubtful whether the treatment is one which would be advisable for those who expect to continue their studies deeper into the chemistry of carbon compounds. It is obvious that either the systematic portion or the theoretical portion has to suffer in a compressed work of this type. One misses the many little experimental helps to the understanding of theory which are possible in such a work as Mellor's "Inorganic Chemistry." Throughout efforts are made, however briefly, to bring in references to works processes. It might have been pointed out that the specific gravity of formalin is that of a solution containing approximately 16 per cent. of methyl alcohol and the boiling point of methyl alcohol is probably nearer 64·8° than the 66° quoted. It must be admitted that it would be difficult in the space of one volume to bring together a much better balanced division of material than is attained in this book. W. R. O.

SYNTHETIC INORGANIC CHEMISTRY: A course of laboratory and class room study for first year college students. By A. A. BLANCHARD and J. W. PHELAN. New York: Wiley and Sons. 1922. Pp. 321. 15s.

The book is a collection of practical exercises in inorganic chemistry—that is, on the preparation and properties of the common gases, the metals, and their compounds. No reference is made to qualitative analysis. The reasons for this in a first year course seem fully justified by the authors, who point out that the experiments are arranged to illustrate the lectures, that they afford more varied types of chemical change than analysis, and, above all, that they are less mechanical and less dull. Regarded as a course to be completed within the year, the number of experiments selected seems impossibly large; but practically the whole of chapters **i.** and **ii.** is devoted to elementary school experiments which are not intended to serve any other purpose than to remind the student of what he has done or left undone, for, as the authors say, "it is unwise to count too much upon an understanding of subjects previously studied" presumably in school. The real college course seems to begin with chapter **iii.**, when the student is at once immersed in the subject of ionisation. The experiments are simple and adequate, and many of them ingenious. Subsequent chapters are devoted to a variety of preparations, chiefly of metallic compounds, arranged in the order of the periodic system, beginning with the metals of Group I. Sufficient detail is given to prevent possible failure. Some of the expressions are unfamiliar to English students, such as "metathetical reaction," which stands for double decomposition; "casserole," which I take to be a porcelain basin, etc. Not the least valuable part of the book is the constant recurrence of questions, which, if answered properly, should develop the student's intelligence in a high degree. J. B. C.

AN INTRODUCTION TO THE STUDY OF THE COMPOUNDS OF CARBON OR ORGANIC CHEMISTRY. By IRA REMSEN. Revised and enlarged, with the collaboration of the Author by W. K. ORNDORFF, Ph.D. Macmillan and Co., Ltd. Pp. 567. Price 10s.

It is pleasant to be able to record the successful and vigorous life of a long-standing favourite among text-books. We agree with the modifications of the first edition, which have resulted in a clearer demonstration of first principles. Occasional references to the technical aspect of certain compounds and chemical changes give the student the proper view that there is something beyond "chemistry for chemistry's sake." The term "colloidal polysaccharides" as a classification heading to cover starch, dextrin, cellulose, and the like, is a good one, and, probably, novel in this country; but "depside" and "levorotatory" may be questioned on this side of the Atlantic. We miss any reference to oxonium compounds, with their important theoretical significance; and some of the formulæ, notably those on page 322, appear as though they were double their true meaning. But, except for these points, the book is so satisfactory as to call for little comment beyond general praise. The index is good, and the letterpress is singularly free from misprints. P. E. S.

ORGANIC ANALYSIS. By E. de Barry Barnett and P. C. L. Thorne. University of London Press. pp. 168. 7s. 6d.

This volume is intended as a companion to the various works on the preparation of organic compounds at present in use. Part I. is devoted to quantitative analysis and has been written with a view to assisting the student to understand the chemistry of groups, rather than merely to "spot" compounds. Part II. deals with qualitative work, and includes ultimate analysis, molecular weight determinations, estimations of groups and of certain individual substances, *e.g.*, sugars, and the titration of dye-stuffs. An appendix deals with the use of Richter's "Lexicon" and of Beilstein's "Handbuch."

In one respect this book is unique amongst volumes of its own nature—it contains but one reference to any published literature, and that is on page 149 where it is stated "the following details are given by Fierz." Doubtless this omission is deliberate and probably is due to the exigencies of space, but one is tempted to think that a student would have been grateful had references been afforded him, particularly in the sections dealing with the estimations of acetyl and diazo compounds and the use of titanium salts—for some of these, as everyone knows, can be notoriously tricky.

It is no unusual comment to say that the book has those faults which are indigenous to first editions. In a subsequent edition a number of misprints should be corrected, and occasional loose statements qualified; *e.g.*, on page 66 "urea gives nitrogen quantitatively when treated with cold NaOBr," and on page 159 the authors' faith in Beilstein is more optimistic than experience warrants: it is stated "it refers to every known organic compound, and cites every reference that has appeared concerning it." Would that it were so! Further, one is more than inclined to doubt the wisdom of advising a student (page 10) that it is not worth while to test for hydrogen in an organic compound.

But despite the foregoing, the book is an excellent manual for a student in a laboratory who is working under the direction of an experienced demonstrator.

D. IVOR JAMES.

THEORETICAL CHEMISTRY. By WALTER NERNST, Ph.D., Berlin, translated by L. W. CODD, M.A. (Oxon). London: Macmillan and Co. New edition 1923. Pp. 922. 28s. net.

This new edition of "Nernst" is the fifth in English and is based on the eighth-tenth German edition. The book needs no recommendation as a standard work of reference on physical chemistry which should be on the shelves of all chemists of whatever special class. Owing to the recent advances in the theory of chemistry additional sections have been added on the structure of atoms, the application of X-rays spectroscopy, and the determination of molecular dimensions. In addition, the chapters on radioactivity and the theory of the solid state have been largely rewritten, thus considerably increasing the all-round value of the work.

Chemicals and Allied Products in Canada, 1921

The following particulars relating to chemical and allied products in Canada for the year 1921 are issued by the Bureau of Statistics, Mining, Metallurgical, and Chemical branch.

THE general depression in manufacturing in 1921 was reflected in the output of chemicals and allied products, the value for the year amounting to only $87,184,000, as compared with $121,686,000 in the preceding year, a decline of $34,502,000. To a considerable extent, however, the drop was due to the fall in commodity prices. During the first quarter, wholesale prices of chemical products declined approximately 12 per cent., and during the remaining months of the year there was a further decline of about 5 per cent., with December quotations on most commodities at the lowest point for the year. The cost of raw materials also reflected the lower prices prevailing, and for all the industries in the group amounted to $42,440,000, as compared with $60,070,000 in 1920, a drop of $17,630,000. Thus, the value added by manufacturing during 1921 totalled only $44,744,000, as against $61,616,000 in the preceding year. While, therefore, the total value of the output in 1921 was $34,502,000 less than in the previous year, the drop in the value added by manufacturing was less than half the decrease in the value of the output, and amounted to $16,872,000. This latter figure reflects more accurately the extent of the depression in the chemical industry during 1921 than the statements of the value of the total output.

Production records in almost every industrial field during the past three years show the effect of post-war influences. In 1919, as a result of the large-scale production during the war years, the accumulation of stocks was considerably in excess of current requirements, with the result that production was much curtailed. Most of these stocks were disposed of in 1919 with the result that in the early part of 1920 an appreciable advance in prices occurred, which reached a maximum about the middle of the year. This advance in prices was followed by increased production, and in many industries 1920 was a banner year. During the closing months, however, demands from consumers for lower prices became more insistent, and in 1921 a nation-wide reduction of inventories and deflation in prices occurred. At the close of that year, although prices were at a much lower level than at the beginning, conditions throughout the industry were much improved, and the prospects for conservative and consistent progress were much better than at any time since the close of the war.

Coal Tar and Its Products

In the industrial group "Coal Tar and Its Products" there have been included only those firms whose principal products were obtained by the distillation of tar or by the manufacture of commodities such as disinfectants made from coal tar and its products. Several other large plants manufacturing building papers, felts and roofing preparations as major products also made creosote oils, refined tar and pitch, but these firms' activities will be reviewed in the publication which includes "Composition Roofing."

Two firms operating in 1920 went out of this line in 1921, but the remaining nine firms accounted for a 16 per cent. increase in the capital investment in the industry, in spite of the fact that the total value of the production declined to 55 per cent. of the value indicated for 1920. The cost of materials dropped to approximately two-thirds of the 1920 record, with the result that the value added by manufacturing amounted to $726,000, as against $1,419,670 in the previous year. Included in the item of cost of materials is the value of products made by the firms reporting and used by them during the year, amounting to approximately $30,000. For previous reports no record of these intermediate products was obtained. The average number of employees was somewhat lower in 1921, but the average earnings per man during the year remained about the same as in 1920.

Acids, Alkalis, Salts, and Compressed Gases

The manufacture of industrial chemicals other than coal-tar products, including such heavy chemicals as sulphuric, nitric and hydrochloric acids, caustic soda, salt cake and calcium carbide, and compressed gases such as oxygen, hydrogen, ammonia and acetylene dissolved in acetone, has been reviewed as an industrial group, but owing to the fact that the manufacture of compressed gases differs appreciably from the manufacture of heavy chemicals the group has been divided again into two sections: (*a*) acids, alkalies and salts; (*b*) compressed gases.

An increased investment in plant and equipment amounting to nearly two million dollars was characteristic of the optimism displayed by the firms in this industry in 1921, in spite of the fact that the gross value of the industry's production declined by practically five million dollars from the preceding year's records. The value added by manufacturing was approximately $8,530,000, while the records for 1920 showed a total of $13,929,000 under this heading. The decline was not, however, so great as these figures would indicate, owing to the fact that approximately two million dollars' worth of intermediate products made in 1921 by the firms reporting was charged back as materials used in further processes of manufacture. A better comparison with the record of 1920 would therefore be obtained if, from the item of materials used, there were deducted the value of the intermediates used. The value added as thus computed would be $10,530,000, and would show a decline of only $3,399,000 from the preceding year's figures.

The average number of employees in 1921 was only 53 per cent. of the average number on the rolls in 1920, but the total payments in salaries and wages was maintained at 55 per cent. of the 1920 records, indicating that for the industry as a whole there was no decline in the rates of wages paid.

ACIDS, ALKALIS AND SALTS.—Capital invested in the twenty-four plants producing commodities under the heading "Acids, Alkalis and Salts" increased in 1921 by more than one and one-half million dollars to a total of $29,900,000. Twenty-four plants were operated in 1921 as against twenty-five in the preceding year. In this industry more particularly than in most other industries covered by this report, there are used as materials large quantities of products made in the same plants. In 1921, out of a total cost represented as $5,000,000 for materials used, more than $2,000,000 worth was made by the firms for their own use. Here, again, as in the coal-tar distillation industry, the computation of value added by manufacturing may be made in two ways for 1921. Although the true value added in 1921 amounted to $6,800,000, the decline from 1920 was only about 25 per cent. when the records for the two years are compared on the basis used in 1920. Thus, although the average number of employees fell off to one-half the number shown for 1920, the production record did not decline nearly as much, and this fact, together with the increased capitalisation, reflected the the stability of the heavy chemicals industry in 1921.

COMPRESSED GASES.—Further progress was made in 1921 in the manufacture of compressed gases in Canada, and the value of the products rose appreciably in comparison with the record for the preceding year. The group includes all firms manufacturing oxygen, hydrogen, acetylene, carbon dioxide, and ammonia. Some firms who did not manufacture their own acetylene purchased the gas and compressed it in cylinders, in which form it was marketed. The manufacture of pure ammonia gas has also been recorded in this group, but the production of ammonia liquor from gas plants was excluded. One new plant was put into operation in Montreal during the year, making a total of twenty-six plants in the Dominion, with every Province represented. The amount of capital employed and the value of products both increased during the year, but the cost of materials was kept slightly below the total for 1920. The number of employees declined 25 per cent., with a corresponding decrease in salary and wage payments.

Explosives, Ammunition, etc.

The industrial group included under the foregoing heading comprises four separate industries, namely: (1) Explosives, (2) ammunition, (3) fireworks, (4) matches.

EXPLOSIVES.—Three new factories for the manufacture of explosives were established in 1921, and one plant discontinued

operations, so that there was a net addition of two active firms. The capital investment in lands, buildings, equipment and ready cash declined approximately $1,000,000, but the value of the output fell off only $400,000 from the preceding year. The cost of materials, shown in the table as considerably higher than in the preceding year, included $2,171,000, the value of products made for their own use by the firms reporting in this industry. The total value of these intermediate products was included both under materials used and products made. The average number of employees working in the explosives industry in 1921 was 44 per cent. less than in the preceding year, and the salary and wage payments dropped correspondingly one-half million dollars.

AMMUNITION.—One additional plant for the manufacture of safety fuses was put into operation during the year, with the result that the capital employed in the ammunition industry was slightly greater than in the preceding year. The value of the products made was, however, 20·5 per cent. less than in 1920. In spite of this fact, and owing to the reduced cost of raw materials, the value added by manufacturing was barely 1 per cent. less than in the previous year, and amounted in all to $1,508,000. The average number of employees and the salaries and wages paid were also lower than in 1920.

Fertilisers

The value of output of the fertiliser industry as reported to this Bureau dropped more than one million dollars to a total of $2,678,000, and the value added by manufacturing fell below the million-dollar mark for the first time in three years. The average number of wage earners employed was approximately 30 per cent. less than in 1920, although the decrease in the total amount of salaries and wages paid was only about 15 per cent. The depression in the industry was very general, and was reflected in the output of fertiliser materials from those other industries in which such commodities were produced as minor products or by-products.

Medicinal and Pharmaceutical Preparations

Although the selling value of the products made in the medicinal and pharmaceutical preparations industry was almost four million dollars less than in the previous year, the actual value added by manufacturing declined only $1,200,000, due principally to the reduced cost of raw materials used. The amount paid out in salaries and wages in this industry was only 14 per cent. less than in 1920, while the average number of employees engaged was 2,230, or 21 per cent. below the average for the preceding year. The capital employed by the 103 plants operating during the year was nearly three-quarters of a million dollars greater than in 1920, a testimony to the confidence felt by the producers of these commodities in the success of their enterprise.

The manufacture in Canada of a sufficient supply of medicinal and pharmaceutical preparations to meet domestic requirements and possibly to develop an export trade is the goal of the industry, and the fact that Canada still imports about two million dollars' worth of these commodities each year is evidence that there is yet room for progress. The manufacture of specific commodities largely used in the manufacture of medicinal and pharmaceutical preparations is probably the most promising field for ventures on a small scale, and several of these have already been established. The industry is becoming more scientific in its methods, and the small backroom manufacturer of nostrums and "cure-alls" is gradually being replaced by the maker of tested products, who knows that commodities made in his establishment will stand examination by the most critical expert. There is still considerable room for improvement, however, in the degree of scientific control applied in these establishments.

Paints, Pigments and Varnishes

The cost of materials used in the paints, pigments and varnishes industry, including the consumption of intermediate products made by several firms for their own use, was $6,200,000 less than the amount spent under this item in the previous year, and the total value of the products made fell off $8,900,000. The value added by manufacturing declined only $2,700,000, and amounted in all to $8,329,000. The average number of employees was about 330 less than in 1920, and came very close to the number on the rolls in 1919. Salary and wage payments, however, were $800,000 greater than in 1919, and were only approximately $131,000 below 1920 payments. The amount of actual capital employed in the industry, which was in excess of twenty million dollars, was practically unchanged from the previous year. The continued campaign to educate the people as to the economy of protecting property by the use of paint and varnish was probably the factor which kept every paint plant working in a year of depression such as that now under review. The effect of this campaign will probably be better shown in subsequent years.

Soaps, Washing Compounds and Toilet Preparations

Nearly seven million dollars' value was added in the working up of the raw materials used in the manufacture of soaps, washing compounds and toilet preparations in Canada during 1921. That the value added by manufacturing was only slightly less than in the preceding year in spite of the fact that the total value of the output was 22 per cent. less than in 1920 (amounting in all to $15,308,000) was evidence of the prosperity attending this industry. The very considerable reduction in the cost of raw materials was the principal factor contributing to this result.

THE SOAP INDUSTRY.—Two additional plants were put in operation in the soap industry, although the total capital employed in this industry at the end of 1921 was about one-third million dollars less than in 1920; most of this difference was accounted for by the lessened values of inventories. The selling value of products made and the cost of raw materials used were both less by four million dollars than the corresponding items for the previous year. Salaries and wages were maintained at about the same level, and the number of employees was practically unchanged. Canada still imports more than one million dollars' worth of soaps annually, mostly from the United States, nearly all of which comes in under the headings "common laundry soap" and "toilet soap." On the other hand, the exports of Canadian soap go principally to the United Kingdom; the total value of the export trade is in the neighbourhood of $200,000. It is expected, however, that the export trade in soaps will be developed very considerably, and that the domestic requirements will also be more nearly met by the early further developments of this strong Canadian industry.

WASHING COMPOUNDS.—The manufacture of washing compounds in Canada during 1921 was one of the few industries in which decided progress was made. Three new plants were established; the capital employed was increased from $158,000 to $256,000; the value of the output was greater and the cost of materials was reduced; and payments in salaries and wages increased 20 per cent., although the actual number of hands employed was about the same as in the preceding year. The ease of manufacture and the ready market for these useful preparations probably accounted for the increased prosperity reflected by the statistics herein presented.

PERFUMERY, COSMETICS, AND OTHER TOILET PREPARATIONS.—While considerable quantities of perfumes, cosmetics and toilet preparations are made as minor products of several other industries, the manufacture of these commodities as principal products has been carried on in Canada for a number of years, and the present section has been prepared as a review of the activities in this growing industry. More capital was employed by the twenty firms operating in 1921 than was reported at the close of 1920, but the value of the output was 15 per cent. less than in the preceding year. The cost of materials, the amount of salaries and wages, and the number of employees engaged were each from 25 per cent. to 30 per cent. less than in the previous year.

Inks, Dyes and Colours

Although one new plant was established, and the capital employed was increased in 1921, the story of production in this industry was the same as in most other industries in the chemical group, one of reduced value of products with a corresponding reduction in the cost of materials and the maintenance of the item "value added by manufacturing" at very nearly the same level as in the previous year. The payments of salaries and wages were lower and the average number of employees was also less. The manufacture of printing inks continued to be the principal item of production,

but the output value of even this commodity was about \$283,000 less than in 1920. There was a corresponding decrease in the value of the mortar colours and shingle stains manufactured in this industry. Dyes and dye soaps fell off slightly in value, but the production of printers' rollers and writing inks was well maintained. The importation of printing inks into Canada continues on a comparatively small scale, the total annual value being in the neighbourhood of \$200,000.

Wood Distillates and Extracts

The production of wood distillation products in 1921 was very much less than in the preceding year, and the value of the output was even lower than in 1919, which was considered a dull year for this industry. In spite of the tremendous slump in the price of formaldehyde, 1,426,000 lb. was produced, as compared with 1,866,000 lb. in the preceding year, but the selling value of the 1921 product was \$221,000, as compared with \$858,000 in 1920. Charcoal made was valued above one million dollars, but the actual quantity was only about 60 per cent. of the 1920 production. Pure methyl hydrate made was slightly greater in quantity, but the selling value of the product dropped from \$727,000 in 1920 to \$267,000 in the year under review. The production of 28 per cent. acetic acid was slightly greater than in 1920, both in quantity and value, but the amount of 80 per cent. acetic acid made was considerably less. Sodium acetate was again produced in small quantities. The extraction of hemlock bark, the manufacture of crude potash by wood-burning, and the distillation of turpentine from wood are all industries somewhat allied to the distillation of wood for the production of acetate of lime and acetone, and for this reason these industries have always been reviewed together. In 1921 there was no production of hemlock bark extract nor of turpentine, but two small plants produced crude potash. The output, however, was very small.

Miscellaneous Chemical Industries

A number of firms operating in Canada produce chemicals or allied products which do not naturally fall in any of the groups previously considered; a miscellaneous group has accordingly been made, and the industries therein have been divided into nine classes, namely: Adhesives, artificial abrasives, boiler compounds, flavouring extracts and jelly powders, polishes and dressings, sweeping compounds, baking powders, insecticides, and chemical products not elsewhere specified. The principal products of the 110 firms thus grouped together have been shown by industries in the production tables; the only comment necessary is to point out that the data given do not represent the total production in Canada of the commodities mentioned, but only the output of the industries producing these commodities as their principal products. For example, large quantities of lime-sulphur solution and other insecticides are made in industries whose principal product places them in other categories. The manufacture of adhesives, flavouring extracts, etc., is carried on in other industries.

Chemical Imports for India

British India is a considerable consumer of chemicals, particularly of alkalis and dyestuffs. The majority of the products are in the hands of British traders as will be seen from the accompanying table which shows the principal chemical imports for 1922, together with the principal source of supply. Germany still supplies the bulk of the dyestuffs with Great Britain a bad second. This is a branch of the trade which might well be captured in the future.

	Total.	Principal Source of Supply.
Sulphuric acid .... cwt.	793	U.K.
Bleaching powder	51,116	U.K.
Carbide of calcium..............	24,663	U.K.
Caustic soda	111,947	U.K.
Sodium carbonate	669,844	U.K.
Sodium bicarbonate..............	93,651	U.K.
Coal tar dyes .... lb.	1,545,168	Germany

Fertilisers for Australia

Imports of fertilisers into Australia for the period July, 1922—April, 1923, were valued at £655,540, compared with £471,341 for the corresponding period in 1921-22.

Mineral Production of New South Wales

The Growth of the Gold Mining Industry

The Officer in Charge for H.M. Trade Commissioner at Sydney has forwarded to the Department of Overseas Trade a review of the progress of mineral production in New South Wales, recently issued by the New South Wales Department of Mines.

This review states that prior to 1850 coal was the only mineral mined in New South Wales, and the total value of the production to that date was £254,375. The discovery of gold in Australia in 1851 furnished the first impetus to the mining industry of New South Wales, and in that year the value of the production amounted to £493,882, of which gold contributed £468,336. The highest yield of gold was obtained in the following year when it amounted to £2,660,946, and this branch of the industry comprised the bulk of the mineral production of the State until about 1874, when it formed approximately 50 per cent. of the output. From then onwards the yield steadily declined until 1894, when it again exceeded one million pounds yearly, largely as a result of the discovery of the Wyalong Gold Field. With the exception of 1901 and 1902 the yield was maintained over the million mark until 1907, chiefly as a consequence of the commencement of gold dredging operations and the extraction of gold from the copper ores of the Cobar District. Thence to the present day the yield of gold has steadily declined and has become a less and less important feature of the mineral industry of the State, until in 1922 the value of the gold won amounted to less than 1 per cent. of the total value of the mineral production. It cannot, however, be too strongly stressed that the future of the mineral industry in New South Wales lies not alone in the resuscitation of gold mining, but in the development of its economic minerals and the exploitation of the silver-lead-zinc resources of the State. It is noteworthy that the most significant developments of recent years have taken place in non-metallics.

Coal and Coke

A cursory review of the mineral industry shows that the trend of coal and coke production is upwards, the output of each having doubled during the past twenty years, and the future prospects are very hopeful. The area of productive coal measures is approximately 16,000 square miles and while comparatively little is known of two-thirds of this area, the evidence of widely separated bores therein suggests that a very great tonnage of good coal, reaching some thousands of millions of tons, may be expected. The output during the past three years has been over 10,000,000 tons per annum, and, if necessary, this output could be very greatly increased without fear of exhausting our coal resources within several centuries.

Lead, Silver and Zinc

The value accruing to the State of the products of the silver lead zinc mines of New South Wales during 1922 was £3,731,566, notwithstanding that full operations have not been resumed at all the mines at Broken Hill since the recent prolonged strike. These figures convey a very inadequate idea of the importance of this branch of the industry as the ores are only concentrated in this State, the major portion of the silver-lead concentrates being refined at Port Pirie, South Australia, and the zinc concentrates at Risdon, Tasmania. The value of the metals extracted in the Commonwealth from ores mined in New South Wales during 1922 amounted to £5,385,501, or an additional value of nearly 1¾ million pounds. It may be of interest to state that among all countries Australia ranks second as a producer of lead ores, third as a producer of zinc, and fifth as a producer of silver. In normal pre-war times the mines on the Broken Hill field contributed about 90 per cent. of the Australian output of these minerals, and these mines may be expected to maintain a high level for the next 20 or 30 years.

It will therefore be seen that the gold production of the State, even in its palmiest days, is dwarfed in comparison with the value of the present-day outputs of coal and silver-lead-zinc alone.

Iron Smelting Industry

Prior to 1907 pig iron, etc., was manufactured chiefly from scrap iron, and the recommencement of the smelting of iron ores in that year resulted in an output of 29,902 tons of pig iron.

The growth of this branch of the industry is exemplified by the fact that the average annual output during the last five years has been about 75,000 tons. This output has been furnished from iron ores mined and smelted within New South Wales, and does not include pig iron manufactured in the State from ores mined elsewhere.

The expansion of the limestone branch of the industry has been very rapid, the manufacture of Portland Cement having increased from 13,400 tons to 187,800 tons, and lime from 20,054 tons to over 33,000 tons during the past twenty years.

There is a decided expectation that the production of clays will increase. Clays of great variety are available in large quantity, and manufacturers in the State are now obtaining most of their raw material from local sources.

Mining for metals such as copper, tin, molybdenite, bismuth, and the tungsten ores, varies in sympathy with the prices ruling in the world's markets. Considerable outputs are furnished if prices are favourable, but dwindle under adverse conditions. Still, it must not be forgotten that these minerals remain as assets to the State, to be drawn upon when needed.

The total value of the mineral production of the State has doubled itself during the past twenty years, and during the last ten years has fluctuated between ten and fourteen million pounds per annum. The output for 1922 was valued at £14,274,770, and has only been exceeded on one occasion—viz., 1918, when the value of the mineral yield was £14,419,352. This State has great possibilities as a mineral producer, and it is confidently expected that the present high rate of production will be maintained in the future, and steadily rise with the growth of the population and the greater demand for the economic minerals.

The Union of South Africa

The Possibilities of Chemical Trade

The Union of South Africa should not be neglected from the chemical point of view. Several industries such as soap making, explosive manufacture, and the mining industry, are well established in the Union and are dependent on a plentiful supply of chemicals. To some extent this need is being met by local production, but there s a wide opening for imported materials, the greater part of which at present are being obtained from British sources.

Development of Local Industry

Some idea of what existing factories are prepared to do may be gathered from the description of the new fertiliser plant at Somerset West, Cape Province. The management there has evidently fully realised what many people in South Africa fail to understand; that is, that a low selling price for a high class product is only possible when the process is carried out on a large scale, and even then only when the plant is fully employed. The Cape Explosives Works, Limited, have put down a plant equal in size and efficiency to anything else to be seen in any other part of the world, and working costs therefore compare most favourably with concerns elsewhere. The South African farmer is now able to get a first class fertiliser at a reasonable price, and the country as a whole benefits since the export trade finds a considerable amount of employment. When the plant is running at its full capacity it turns out 180,000 tons of superphosphate per annum, of which only 60,000 tons are required for the Union itself.

A point of importance is that new South African chemical industries are now able to avail themselves of the services of a number of young South Africans who have been trained as industrial chemists and chemical engineers. The South African universities are not too much hampered by tradition, and at least one of them is now offering a full degree course in chemical engineering.

Nearly all manufacturing concerns need a plentiful supply of fuel, water and abour. Of these good fuel and unskilled labour are obtainable, although South African native labour is not nearly so efficient as that to be obtained in certain Asiatic countries, and the questions of skilled labour and of water-supply are the chief difficulties encountered in the establishment of chemical plant in the Union.

Imports of Chemical Products

It must not be thought that these developments close South Africa as an importing State. A glance at the figures below will show that considerable quantities of chemical products are imported annually, by far the largest import being sodium cyanide, which is, of course, used in immense quantities in the extraction of gold. It will be noticed from the import figures, which are only given for the products most largely required, that in the majority of cases Great Britain is the principal importer, a fact which is perhaps due to the preferential tariff. In general there is a duty of 20 per cent. on chemicals, with a reduction to 17 per cent. for British products :—

Import.	*Total Value.* £	*Principal Importer.*	£
Borax	9,708	U.K.,	9,642
Calcium carbide	18,229	Canada,	8,553
Soda ash	19,489	Kenya,	6,658
Caustic soda	99,180	U.K.,	96,648
Sodium cyanide	240,788	U.K.,	143,824
Sodium arsenite	53,850	U.K.,	50,504
Ammonia, anhydr.	8,398	U.K.,	4,080
Sulphate of ammonia	55	U.K.,	55
1921	12,594	U.K.,	10,912
Superphosphates	58,710	Belgium,	31,556
Basic slag	11,873	Belgium,	4,757

The Development of Empire Trade

Views of the Federation of British Industries

The Federation of British Industries appointed early this year a committee to consider the question of inter-Imperial trade. They recently presented the first interim report of this committee to the Government.

The report deprecates the tendency in certain quarters to adopt the attitude that the economic difficulties of this country can be entirely solved by rapid and considerable development of trade with the Dominions, and that in Empire markets will be found the means of restoring trade lost in other parts of the world. On the evidence of trade statistics alone they hold such an assumption is untenable. For instance, British export figures show that the ratio of Imperial to foreign trade has remained practically constant over the period 1913–1922. Thus the total United Kingdom exports in 1922 were 68·9 per cent. of the pre-war figure; the total exports to the Empire being 70 per cent. of pre-war, as against a total for foreign countries of 68·2 per cent. They point out that many of our existing manufactures being intended for a white population in a state of high civilisation, it is useless to expect that the relatively small white population of the Empire, however high its individual purchasing capacity per head, can take the place of our European markets as consumers of British goods in any near future.

Conferences Proposed

The Federation of British Industries welcome the summoning of the Imperial Economic Conference, and suggest that every year subsidiary conferences, consisting of high commissioners and other resident representatives of the Dominions in this country, together with the representatives of the British Government departments concerned, should be held to deal with matters of detail. A small permanent secretariat should, they suggest, be instituted, charged with following up the results of one conference and preparing for the next.

The Dominions should be helped as far as possible in the development of their industrial undertakings as well as their raw materials by the provision, where possible, of capital and experience, since it is infinitely preferable that British Dominion industries should be developed by British rather than by foreign enterprise and capital.

The Federation express the opinion that they are driven to the conclusion that a full development of inter-Imperial trade is to a large extent dependent upon the restoration of normal conditions in other parts of the world, which in the past have been large purchasers from the Dominions; in other words, that the Empire cannot be taken as a separate entity or a self-contained unit, but that its trade is internationally interdependent, and that, for instance, until Europe has made some progress towards recovery the volume of inter-Imperial trade cannot be expected to grow as rapidly as is desired.

Regarding Imperial Preference, there is so deep a difference of opinion in the industrial world that the Federation cannot,

as representing all the industries of this country, put forward a unanimous opinion upon this subject, and is therefore arranging for the different industries of the country to put forward their own views.

The Question of Protection

The Federation holds that if the Dominions wish to increase their importation of British goods, some action should be taken to protect the British manufacturer either from countries with depreciated currencies or whose lower standard of life renders cheaper production possible. It is hoped that this will be discussed at the Imperial Economic Conference with a view to seeing how far it is possible to ensure that anti-dumping legislation, such as already exists in Australia and New Zealand, can be put into operation throughout the Dominions.

The Federation draw the attention of the Government to the lack of uniformity which exists and the continual changes which take place in the basis of assessment for Customs duties throughout the Empire. This, the Federation consider, is a great barrier to the development of inter-Imperial trade, and, recognising that the practice of *ad valorem* tariffs renders uniformity difficult, suggest for the consideration of the Imperial Economic Conference the desirability of considering tariffs based on weights or specific duties. The Imperial Customs Invoice Form was an effort to secure uniformity, but its value has been destroyed by the difference of procedure insisted upon by the various Dominions or Colonies to adopt it.

The Conference is also asked to consider the lack of uniformity which exists with regard to general questions connected with Customs.

Production of Raw Materials

Regarding the problems: (1) How to increase Imperial production; (2) to ensure that Empire raw materials find a market, and will be bought by the United Kingdom in preference to those from other countries, the report says:—

1. The development of new sources of materials is dependent upon adequate labour resources, but should be assisted by Government grants and by private British capital where possible, so that the sources of supply shall be kept within Imperial control.

2. Raw materials are usually bought solely on the grounds of price, quality, and regularity of supply and standard. Therefore, the necessity exists for careful study to ensure the flow of Empire raw materials to the United Kingdom at an economic figure and in regular quantities. The Federation consider that there is need for closer commercial touch between the Imperial producer of raw materials and the United Kingdom industrial consumer, and are prepared to consider a development of their organisation to undertake this work.

They also suggest two ways of assisting the development of Empire raw material consumption:—

1. By considering the reduction, if not the abolition, of the export duties on raw materials at present existing in certain Crown Colonies;

2. The Government so to arrange their tenders for supplies that no foreign tender shall be accepted until it is evident that Empire materials cannot be obtained at anything approximating competitive conditions—the Dominions, as far as possible, to take reciprocal action.

The Work of the Trade Commissioners

The Federation feel that it is the Government's duty to obtain information upon the broad tendencies of trade within the Empire, the commercial community being to a large extent capable of obtaining for itself commercial intelligence of a more detailed nature. They hope that some attempt will be made at the Imperial Economic Conference to give British trade commissioners in the Dominions sufficient status to enable them to act as official spokesmen for the Home Government.

In regard to the commercial intelligence service, the Federation believe that the number of posts now existing is sufficient, and that attention should be directed to increasing the efficiency of the existing posts rather than of creating new ones. For this purpose they recommend the necessity for granting trade commissioners ample travelling allowances, and that they should keep in the closest touch with the commercial community in this country.

Italian Chemical Production

Limited Activities

The Italian chemical industry comprises at present 430 establishments, and employs about 100,000 persons. During the war the import of certain products was hindered, and numerous plants for their manufacture were established.

After the Armistice, on account of the general crisis and foreign competition, the chemical industry had to limit its activities, and present production is much below capacity. The following table is instructive:—

Production of	1913. Tons.	1919. Tons.
Sulphuric Acid	625,944	529,582
Sulphate of Copper	41,272	73,334
Calcium cyanamide	211,190	728,520
Caustic Soda	11,589	18,303

The recently established dyestuffs industry has specialised in a few types, and has succeeded in obtaining a footing in foreign markets, but production is now limited owing to foreign competition. The same may be said of pharmaceutical, organic and synthetic products.

The soap industry, on the other hand, has almost recovered its normal activity. Before the war there were 500 factories, with a yearly output of nearly 150,000 tons. Production decreased during the war owing to difficulty in replenishing stocks of raw materials, but after the Armistice it gradually recovered, and is now about 75 per cent. pre-war. Acids and essences constitute a thriving business. In 1920 the export of essences totalled 820 tons, citric acid 1,830 tons, and citrate of calcium 8,780 tons. The citrate of calcium produced in Sicily and Catania represents about half the world's production. This particular branch of the industry, however, is passing through a crisis, owing to the prohibitive duties in force in nearly every foreign state.

The value of Italy's imports of raw materials for industrial purposes last year amounted to 5,504,837,000 lire, representing 36 per cent. of her total imports, while exports of raw materials amounted in value to 1,165,198,000 lire, or 12·5 per cent. of her total exports.

Of half-finished goods, the value of imports was 2,825,708,000 lire, and of exports 2,816,012,566 lire, representing 18 per cent. and 30 per cent. of the respective totals. With manufactured goods different results are shown, imports being 2,394,260,763 lire in value and exports 3,126,676,321 lire. Foodstuffs and live animals to the value of 5,006,514,680 lire were imported, against 2,184,362,248 lire exported. It will be seen that in foodstuffs and raw materials imports were greatly in excess of exports, whilst in manufactures there is a considerable increase of exports over imports.

Coal Dust Explosions

Experiments by the Research Board

The Safety in Mines Research Board experimental station, at Eskmeals, Cumberland, was visited on Sunday last by a party from the Northumberland and Durham coalfield, representative of the colliery managements, the North of England Institute of Mining and Mechanical Engineers, and the workmen, to witness a series of demonstrations of coal dust explosions, showing the different degrees of inflammability of coals.

In the first experiment pure coal dust was sprinkled over a gallery for a distance of 350 feet at the rate of 1 lb. per linear foot. After the mixture was ignited a terrific explosion occurred, and the after-damp had to be fanned out of the tube. Timber and props were blown out by the force of the explosion. In the second experiment the gallery was strewn with a mixture of coal dust and stone dust in equal parts at the rate of 2 lb. per linear foot. There was the same explosion, but instead of the flame tearing along the gallery, it died out in about thirty feet. The after-damp was scarcely noticeable, and the timber and props were left standing.

In reply to a vote of thanks, Dr. Wheeler, who is in charge of the experimental station, said that the main object of the demonstration had been to show what a coal dust explosion could do if precautions were not taken to prevent it spreading.

The Colouring of Poisons

To the Editor of THE CHEMICAL AGE.

SIR,—May I, as an analytical, dispensing, and manufacturing pharmaceutical chemist, with some forty years' experience in these various branches, be allowed to reply to Mr. Sexton's letter in last week's issue. I would submit that in the matter of "colouring poisons for medicinal use" no one without a practical knowledge of the subject is qualified to give an opinion for or against, and a debate in the House by members the majority of whom would be entirely ignorant of the subject debated would be either useless or, possibly, very dangerous. I entirely agree with the decision of the General Medical Council. The "a preparation of strychnine" mentioned I presume to be the Liquor Strychnine of the B.P. (a solution the official strength of which roughly is 1 per cent.), and to colour this green certainly would be objectionable in many ways and would be no safeguard against carelessness. If carelessness occurs with a colourless preparation it will occur with a coloured one. The novelty of being coloured will soon wear away.

But the greatest difficulty in legislating would be to define what is "a preparation of strychnine." Take the hypodermic tablets of varying strengths. To introduce colouring matter into these would be as unscientific as colouring distilled water which has been distilled to free it from all organic or inorganic impurities. Then, Mr. Sexton cannot be aware that there are, besides the preparations of "nux vomica," many others prescribed containing strychnine the natural colour of which would make it impossible to colour "green." I could enlarge considerably on the subject, but I have probably drawn sufficient attention to the difficulties to show that it is not a matter for men without the necessary qualifications to meddle with.—Yours, etc.,

GEORGE D. YATES.

Howbeck Road, Claughton,
Birkenhead, July 19, 1923.

Aluminium Sulphate from China Clay

To the Editor of THE CHEMICAL AGE.

SIR,—In THE CHEMICAL AGE of to-day, the writer on this subject properly insists on the necessity for removing the 0·75 per cent. oxides of iron that usually exist in China Clay, although he does not mention the oxide of titanium that is also usually present. There is no difficulty in removing both these oxides at a cost of a few shillings a ton; in fact, a China Clay company is actually doing this at the present time. Moreover, bauxites holding 25 per cent. of these oxides have been completely cleansed in the same way, and the oxides recovered as paint bases. But the recovery of aluminium sulphate from China Clay, although possible, may not appeal to capitalists as a seductive proposition.—Yours, etc.,

A. WORSLEY.

Isleworth, July 21.

The New Motor Fuel "Discol"

AT the annual meeting of the Distillers' Co., on Thursday July 19, Mr. Graham Menzies referred to the new motor fuel, "Discol," which the company has recently put on the market. A year ago, he said, they had just launched this new product at their Hammersmith Distillery. Since then they had established a mixing depot at Bankhall Distillery in Liverpool, and within the past ten days they had completed and opened up at Pingston Station, Glasgow, a depot from which the Scottish orders would be supplied. He believed the oil companies recognised the advantages of having such an alternative fuel ready in case of emergency, and were therefore less disposed to regard them as competitors than as coadjutors having a common object. They had no intention at present of putting up "Discol" in the usual two-gallon cans, but would confine their trade principally to commercial users or to those private users who could take a fifty-gallon drum at a time. The success of alcohol mixtures as fuel for racing cars and cycles had been very marked, and they had an increasing demand for this purpose, not only within the United Kingdom but also from the Continent.

Lesser Known Uses of China Clay

[FROM A CORRESPONDENT]

THE uses of china clay in paper, pottery and cottons, and its properties as a bleaching material, are fairly generally known, but many uses to which it is applied in chemical manufactures are not so familiar.

China clay is undoubtedly being more extensively appreciated by industrial chemists as a raw material whose adaptability makes it very valuable owing to its freeness from injurious constituents which might prove detrimental to the manufactures in which it is used.

To indicate the directions in which it has been employed for some years a few instances will suffice. As a raw material in the manufacture of artificial alum it is largely used. Many years ago the Germans worked on a patent for the manufacture of alum from china clay, and in France, where alum ores have not been plentiful, alum has been manufactured from china clay very extensively.

Another article of great commercial utility, which has enormously cheapened in consequence of the discovery years ago of china clay in its manufacture, is ultramarine. Something like 100 years ago the price of ultramarine was 20 guineas per pound, but 50 years later two German chemists made a discovery of a process for the manufacture of artificial ultramarine at a cost of a little over 20s. per lb., since when the development of its manufacture has resulted in the production of a material that is now comparatively cheap. The cheapening of ultramarine has naturally led to its greatly increased use, so that its production of about 50,000 cwt. about 60 years ago has risen to the present day to over 20,000 tons.

As the originators of its manufacture, it is only natural Germany should have been the biggest producers of ultramarine up to before the war. The fact that up to 1914 Germany was the second biggest foreign buyer of our English china clays seems to point to the making of this commercial product, and other chemicals closely allied to it, as being responsible for its large consumption. It is said that china clay constitutes about half of the materials necessary in the manufacture of ultramarine, so that the possibilities of its increased demand for this purpose are considerable.

Amongst many other uses to which china clay is put, from the point of view of industrial chemistry, and which are capable of still further cultivation, are in the manufacture of copying ink pencils, oil and water colour paints, toilet powders and cosmetics, cleansing soaps and powders, disinfectants, chemical manures and linoleum.

The purpose to which it has so far been used to only a limited extent is as an alloy in rubber, but when its properties are thoroughly understood by rubber manufacturers it is possible that china clay may in time supersede the use of the other materials, which are now being used in rubber to serve the purposes for which it is claimed by some industrial chemists china clay is equally adapted. Successful experiments have been recently made with it in conjunction with rubber for certain road-making materials.

Determination of Ozone in Air

IN the past few years the question of utilising ozone for purifying air in ventilation of buildings, and also the air of refrigerating plants, has been receiving much attention. Ozone is a rare gas, with active oxidising powers, and engineers see great possibilities in its use for purifying of air used in ventilating public buildings, to remove odours, and destroy bacteria. Its use has also been proposed for bleaching textiles and sterilising them. The United States Department of the Interior, through the Bureau of Mines, is co-operating with the Society of Heating and Ventilating Engineers in four important problems: (1) Methods for quantitative determination of ozone and oxides of nitrogen in ozonised air; (2) amount of concentration that will produce the desired results and the limiting amounts permissible to breathe without harmful effects; (3) tests of ventilation systems using ozonised air; and (4) use of ozone in connection with re-circulation of air in buildings. The Department of Interior, through the Bureau of Mines, has worked out a method of determining oxides of nitrogen produced by ozone apparatus, by which it was shown that these oxides were not produced in harmful amounts in ventilation apparatus.

A Debate on the Dyestuffs Act

Criticism and Defence of Present Policy

In a debate on Wednesday, July 19, in the House of Commons on the question of British trade, Lieut.-Commander Kenworthy raised the question of the dyestuffs policy. He quoted a speech by the chairman of the British Cotton and Wool Dyers' Association complaining of the high prices which British colour users had to pay for dyestuffs compared with their competitors abroad, and of the unsatisfactory way in which arrangements for granting licences had been worked.

Dr. Clayton's Defence

Dr. G. C. Clayton (Widnes) said it was extremely satisfactory to him that the President of the Board of Trade was so interested in the development of the industries of this country. If in the past the Board of Trade had taken the same interest in manufacture of dyes we should never have lost that industry in this country. We started it here, and we had the raw materials and the knowledge, but at that time there were a great many restrictions put upon the industry by the then Board of Trade, and it drifted away and went to Germany, where they gained the advantages that we could not obtain in this country. We had all the raw materials for the dye industry. Prior to the War a great deal of that raw material was sent to Germany, worked up there with their labour and consuming their raw materials, coal, etc., and it was returned to this country in the form of dyes and used by us. There was no reason why those dyes could not be made here. He was pleased to say that enormous progress had already been made. Great satisfaction had been given to the dye users. There might have been some who had had some difficulties in obtaining the dyes they wanted, but generally there had been great satisfaction. They agreed that very great progress had been made, and he felt sure that under the help and guidance of the present Board of Trade we should get established in this country a dye industry that could hold its own with any other dye makers. Apart from the fact that we have all the raw materials to make the dyes in this country, the dye industry required a very great deal of labour, not only in actually making the dyes, but in preparing the raw materials for those dyes. He wanted that labour to be found in this country and not in Germany. We had also to consider the safety of the textile trade in this country. We needed an adequate supply of dyes on which we could rely as being made in this country. There were times, such as the present time on the Ruhr, when it was impossible to get dyes. Other occasions might easily occur when it would be impossible to get foreign dyes, and we must maintain our textile trade. He felt that it was very important for that reason also that we should have a dye industry here. During the War we had to manufacture a large number of chemicals which were really intermediates in the dye industry. We required those chemicals for explosives.

A School for Chemists

Before the War, in Germany, when they had manœuvres, the dye manufacturing works were turned on to make the materials for explosives. They had duplicate plants, one for making the dyes and the other for making the explosives, and a part of the manœuvres was the turning over of the dye works into explosive works to show that they were prepared in case of emergency. He did not say that we need do that, but if we had the dye industry established in this country we had the potential plant for making what we required in a case of emergency. He thought that was a matter of considerable importance to this country. Further than that, the dye industry was a most valuable school for chemists. A very large number of chemists were required, both in the manufacture of the intermediates and of the dyes, and as a school for chemists it was of great value. These chemists were used in every other industry, and we could draw on the dye industry for these men when required. If we had no such school we should fall behind in very many of our industries. He maintained that the chief objections to this subsidy to the dye industry came from the merchants who supplied the German dyes. He did not believe that the objections really emanated from the users but from these traders in foreign dyes. He thought our British interests were vastly more important than the interests of these dealers in German dyes.

Delay and Interference

Mr. Hope Simpson (Taunton), later in the debate, reverting to the Dyestuffs Regulations, said the dye merchant was being systematically squeezed out of his trade under the present administration. The greatest evil of all was the compulsion on the merchant to reveal the name of his customer. There might be a good reason for that, but the dye merchant felt it very seriously, because it was one of the trade secrets which every merchant naturally wished to keep to himself. The regulations also involved great delay and interference, which was not only unnecessary, but deliberately vexatious. The objections to the regulations from the point of view of the dye-user were the administrative difficulties and delay, and the increased price, which put a handicap on our dyeing industry in comparison with the dyeing industry in other countries. During the last fortnight he inquired, on a request from Australia, the price of indigo produced in England, and found that it was £400 per ton more than the German article. That was a terrible handicap on our manufacturers. What were the results? The figures showed that in 1922, as compared with 1920, while the export of unbleached cotton greys increased by 55 per cent., the trade in dyed goods decreased by over 35 per cent. That was absolutely conclusive proof that our dyeing industry was a dying industry—that cloth was being exported to other countries where it could be dyed cheaper owing to the lower price of dyes and dyestuffs. The President of the Board of Trade said it was not due to the price of dyestuffs. Then what was it due to? He would suggest that when merchants applied for licences they should immediately be granted temporary licences for the import of small quantities while the inquiry was taking place.

The Government Reply

Sir Philip Lloyd-Greame, in the course of his reply, dealt with the several points raised, and said that one would suppose from the speeches made in regard to the issue of licences for dyes that an autocratic Department was blocking the way. As a matter of fact, the work was done by a committee consisting of representatives of the trade and independent members, presided over by a distinguished member of the House. He had had a return made showing the rapidity with which licences were disposed of. In February, 73 per cent. of the applications were disposed of within two days; in March, 79 within three days; in April, 82 within four days; and in the following months 89 within four days. It was most necessary that the merchant should be made to give particulars. The Licensing Committee wanted to be satisfied as to the price of the dye and the necessity of the dye. It was necessary to have some further particulars than a mere application from a merchant who might want to bring in tons of German dyes and sell them wholesale in this country.

Coming to the broad question of policy, he said that the value of the dye industry to the textile industry of this country was greater than ever before. The occupation of the Ruhr had taken place, and great uncertainty existed as to whether the dyes would come forward at all. He knew one company which had been manufacturing day and night almost since the occupation to supply the things that were needed. The textile trade would have been in a very anxious position in the last six months if it had existed entirely on dyes coming from the Continent. New mills were being put up all over the world. That was the new position Lancashire had to face, and it would be unwise to leave Lancashire without the certainty of a dye industry to rely on, leaving open the possibility of a combination between foreign dye-makers and foreign mill-owners which might be seriously to our disadvantage. It had been said that the dyes that were being made were bad. The chairman of the Dye Users' Association had paid a tribute of admiration to the makers for the progress achieved in the production of dye-stuffs in the last few years. As an indication of their progress he mentioned that our pre-war consumption of German and other foreign colours was 70 to 80 per cent. of the total, and that last year we used 70 to 80 per cent. of British dyes, this change having been effected without in any way reducing our standards. He hoped hon. members were not going about putting forth the libel that British textiles were not fast in their dyes. Speaking of price, he said that as long as a dye was not made in this country the German price was up. Only when it was made in this country did the German price come down. If we gave up making the dye the German price would go up again.

Nitrogen from the Air

New Enterprise by the British Cyanides Co.

At the annual general meeting of the British Cyanides Co., Ltd., in London, on Thursday, July 19, an important statement was made by Mr. Kenneth M. Chance (managing director) respecting the company's scheme for the fixation of nitrogen from the air.

The fixation of atmospheric nitrogen, Mr. Chance said, as it concerns this company has two stages. The first stage is where we can obtain from the nitrogen of the atmosphere raw material in unlimited quantities for the cyanogen products which we manufacture. The second stage will be when we can fix atmospheric nitrogen at a sufficiently low cost to convert it into ammonia at a price which will enable us to compete with any other method of manufacturing ammonia. It has been obvious now for many months that we were rapidly approaching the first stage, and the chairman has left it to me to inform you that on the recommendation of the General Staff Committee, the board have to-day given instructions for estimates to be prepared for a plant for manufacturing cyanogen from the nitrogen of the atmosphere, and a special board meeting has been summoned in a fortnight's time to consider these estimates and to decide upon the number of unit plants to be erected at once. (Applause.) The plant for this stage of the process is not a costly one, nor will it take long to erect, and although we are bound to have some troubles when we start to operate it, the type of plant that we have decided to install is one familiar to all of us, and but for some unforeseen catastrophe within a few months' time we should be supplying the markets of the world with a part of their requirements of these cyanogen products for which our reputation is established manufactured from nitrogen of the atmosphere. (Applause.)

Two Plants in Course of Erection

The second stage is one which can only be reached gradually but we have two plants in course of erection, each of which is a practical working unit, and the prospects of being able to fix the nitrogen of the atmosphere at exceedingly low cost in both these plants are excellent. But, however successful either or both these plants may be, there will of necessity be a great deal of work to be accomplished in directions of which we are fully aware, and the work for which is already mapped out, before we can have reached our ultimate goal of the manufacture of synthetic ammonia cheaply by this process. How important the first stage is, however, you will understand when I repeat that all through the history of this company our work has been hampered through lack of raw material. A few months ago we were able to make a contract for the purchase of raw material in unlimited quantities, but at high cost. Trade was then exceedingly good, and our profits rapidly expanded with our output. Now trade is bad, but it will recover, and, as the chairman has told you, it has already—unexpectedly early in my opinion—shown signs of recovering. Even at its worst there is a market—and a big market—for our products if we can manufacture them sufficiently cheaply. Our factories can handle large quantities of raw material, and as we get this new plant going that raw material will be available at low cost and in any quantity for which we may decide to lay down additional units as opportunity arises.

Progress in Other Directions

The importance of this announcement must necessarily overshadow the progress that we have made in other directions, but I should not be doing justice to the admirable work of our staff at Oldbury were I not to make brief reference to this progress. A few months ago the opportunity arose for us to reopen our Tat Bank Works for the manufacture of a chemical that we had not made since the war was over, and the rapidity with which this process was established on a large scale was a great tribute to the keenness and efficiency of our staff and the efficiency of our Tat Bank Works. I knew that we had completely reorganised that factory when we made the new issue of capital in 1920, but it had been closed down for so long that I had forgotten how efficient we had made it, and this test was the best proof that the money had been well spent.

Permanganate of Potash

We have now overcome the last difficulties in respect of the manufacture of permanganate of potash by electrolysis, and new plant for the manufacture of that chemical is in course of erection at the Tat Bank Works, and should be in operation very shortly after the holidays. Our new works scale experimental house has also enabled us to prove out the manufacture of another chemical for which there is a good market, and it is only a question of time before we shall add this to the growing list of new processes that we are establishing. But I expect that the opening up of the permanganate plant and that for the fixation of atmospheric nitrogen will keep us rather too busy to take up any other work for the next few months.

Apart from the threat of chaos contained in the European situation, I am confident that at last, and for the first time in the history of the company, its industrial operations are established on a firm basis, and that we have an assured future before us which should prove a very great one. We have worked for this for a great number of years. Members of your staff and workmen have given the best years of their lives to the solution of this problem, and you shareholders have entrusted to us large sums of money for the same purpose. With that money we have built and equipped factories to handle far more raw material than we have hitherto been able to obtain, and have created organisations for manufacturing and selling on a scale commensurate with our anticipations of success on this problem. We are therefore ready to expand our business rapidly, and I can assure you that the natural desire of the shareholders to obtain some recompense for these long years of waiting is more than equalled by the keen anxiety of your staff to bring this great work to fruition. (Applause.)

An Epoch-Making Meeting

Acknowledging a vote of thanks to the board, the Chairman (Mr. C. F. Rowsell) said that he and his colleagues looked upon the present meeting as an epoch in the history of the company. When he came to the city on the previous day he did not know that he would be able to ask the managing director to make so definite a statement with reference to the experiments which they had been carrying on for so many years as he had been able to make on the present occasion. This, of course, was only a beginning, and it was going to lead undoubtedly to very great things for the company. (Applause.)

The proceedings then terminated.

Mond Nickel Co., Ltd.

The ninth annual general meeting of the Mond Nickel Company, Limited, was held on Thursday, July 19. The Rt. Hon. Sir Alfred Mond, Bart., M.P., presided, and after expressing his satisfaction at resuming the chairmanship of the company, said the demand for nickel, which had been at a very low ebb, had sustained a very considerable improvement during the past year, an improvement which at present was maintained, and the company's turnover and deliveries had been satisfactory. Their production had been increased, and their works were well employed, but the prices which had been ruling, owing to a somewhat unrestrained competition from a good many sources, had been lower than at almost any other period of the industry, and had counteracted to some extent the benefits derived from a larger sale and a larger production. Copper sulphate, of which the company was the largest manufacturer in the United Kingdom, and which was a product chiefly exported to the Continent, largely to France, had suffered not merely from competition but also from severe fluctuations and unfavourable exchanges in most of the bigger export markets, such as France and Italy. The world's trade was still in a very disturbed condition, and although he did not wish to enter into a statement as to the present position of Europe and the many difficulties which had arisen in connection with the settlement of the peace, he could say without fear of contradiction that it would be a great relief to all business men and, in fact, to the entire world if those vexed questions could be settled finally or, at any rate, an opportunity given for business to return to a more normal condition. The uncertainty all over the Continent was immensely harassing to business, and was unparalleled in the history of industry. In spite of these adverse factors, the profits showed an increase, and he looked on the position of the company as extremely sound.

From Week to Week

THE JOHN DALTON Chemical scholarship in the University of Manchester has been awarded to Mr. Wilson Baker.

MR. F. A. BANNISTER, B.A., has been elected to the Denman Baynes Studentship for research in physics at Clare College, Cambridge.

THE TITLE of Reader in Organic Chemistry has been conferred on Dr. O. L. Brady, D.Sc., F.I.C., of University College, London.

THE DEATH occurred on Saturday, in his 54th year, of Mr. William Smith, for twenty years laboratory steward of the Institute of Chemistry, London.

THE NATIONAL BENZOLE COMPANY announce a reduction in the price of National Benzole mixture to 1s. 8½d. per gallon, which brings it into line with the present price of petrol.

THE OFFICIAL REFEREE (Sir Edward Pollock) has awarded the Rio Tinto Co. £220,152, on a claim against the Government for the supply of cupreous pyrites to the Allies during the war.

THE DEGREE of Ph.D. (Science) has been conferred by the London University on Mr. H. Phillips (Battersea Polytechnic) for a thesis entitled "The Relation between Chemical Constitution and Optical Rotatory Power."

OWING TO THE WORK of redecorating the rooms of the Chemical Society, the library will be closed during the entire month of August, and in accordance with the usual practice will close at 5 p.m. daily from September 1 to 17.

AN AGREEMENT has been signed between the principal pyrites producers for the purpose of the better regulation of the production of pyrites and of the stabilisation of prices to consumers, with a view to developing the consumption of this product.

A CHEMICAL company in the United States, the Federal Chemical Co., of Nitro, Virginia, has begun the production of alcohol with an output of 5,000 gallons daily, to be increased as soon as possible to 20,000 gallons daily, and the company has sold a large part of the production for some time ahead.

MISS MARION HAYES, daughter of the caretaker of Oldham Education Offices, has obtained the degree of B.Sc. at Manchester University, where she has been studying on a scholarship won when a pupil at Oldham Munici pal SecondarySchool. She also secured the LeblancMedal in bacteriological chemistry.

AT THE LAST MEETING of the Board of the Institute of Physics the following corporate members were elected:—Fellows: C. H. Desch, M. Fishenden, W. M. Jones and S. Marsh; Associates: R. P. Black, M. Brotherton, J. F. Congdon, D. E. Jolin, H. Lowery, S. P. Peters, L. J. Sutton, N. W. Turnell, A. Whitaker and L. Wright.

MANLOVE, ALLIOTT & CO., LTD., engineers, Nottingham, issue through the post a neatly prepared folder showing representative types of machines and apparatus for the chemical trades manufactured by the firm. These include filter presses, drying machines, digesters, evaporators, centrifugal mixers, centrifugal machines, and film evaporators.

SIR HERBERT JACKSON on Saturday last declared open an extension of the Harvey Laboratory at the King's School, Canterbury, and in the course of an address pleaded for the recognition of the principles of science in education. The new chemistry lecture-room and the biological laboratory will bear the names respectively of John Linacre and Tradescant.

MR. HARRY BARDGETT, B.Sc., eldest son of Mr. John Bardgett, Westgate Road, Newcastle, has received an appointment as analytical chemist at the Government experimental station, Eskmeals, Cumberland. Mr. Bardgett won scholarships at Rutherford and Armstrong Colleges, and for three years has been assistant demonstrator in metallurgical chemistry at the latter college.

IN LAST WEEK'S issue of THE CHEMICAL AGE (China Clay Section) reference was made to the prospect of successful operations at the old works of the Dartmoor China Clay Co. at Shipley, South Brent. We are informed by the Dartmoor China Clay Co., of Plympton, Devon, that the works at Shipley are not their property and that they have never operated in that district.

DR. CHARLES A. BROWNE, of New York, has been appointed head of the Bureau of Chemistry, U.S.A. Department of Agriculture. Dr. Browne was formerly with the Bureau of Chemistry, resigning in 1907 to accept his present position of chief chemist with the New York Sugar Trade Laboratory. The office of chief of the Bureau of Chemistry has been vacant since the resignation of Dr. Carl L. Alsberg, July 15, 1921.

AS THE RESULT of a fire last week at the premises of Dussek Brothers and Co., disinfectant and oil manufacturers, at Canterbury Bridge, Deptford, some hundreds of barrels of tar and oil were destroyed and the boiling and distilling rooms and stores severely damaged. At the Victoria Wharf, Deptford, property consisting of exhibits belonging to the Exhibition branch of the Board of Trade, and valued at from £40,000 to £50,000, was also destroyed by fire.

LORD LEVERHULME at the dinner of the Pharmaceutical Federation in London on Tuesday offered to the Society the sum of £1,000 in Lever Brothers 20 per cent. preference shares, producing £200 a year. This, he said, would be expended as follows: £10 for the provision of medals, £10 for books, and the remainder for three scholarships of £60 each in three colleges. "What is wanted nowadays," he declared, "is not so much politics and politicians, but business men who can make goods and sell them."

THE OFFICIAL REPORT of the Preliminary Inquiry into the explosion of an oil pre-heater at the by-products works of the Mitchell Main Colliery Co., Ltd., Wombwell, was issued on Tuesday, July 17, under the Boiler Explosions Act. At the conclusion of the report Mr. Thomas Carlton, the Assistant Secretary of the Mercantile Marine Department, stated that, had the relief valve been properly set and in good working order, the heater would have been fully protected against over pressure from any cause, and the explosion would not have occurred.

IN 1912 a United States patent was granted to a German chemist, which it is said in general language describes a process and product similar to insulin and its method of production. Mr. Francis P. Garvan, head of the Chemical Foundation which acquired the rights to thousands of American patents issued to Germans and which had been seized during the war, submitted the patent to a number of chemists. After carefully examining it, they were disinclined to say that it specifically recorded a process similar to that used for the production of insulin, but they declared in general terms that the two were alike.

INSULIN, the new treatment for diabetes, with vaccines, sera, and salvarsan, is included in the Bill which Lord Onslow (Parliamentary Secretary to the Board of Education) has introduced for regulating the manufacture, sale and importation of therapeutic substances. Manufacturers and importers, the Bill provides, must have licences, and the penalties are a fine up to £100 for the first conviction, and the same fine or up to three months' imprisonment for subsequent offences, with forfeiture of the goods. To frame regulations a committee is being appointed which will include the Minister of Health. It will be advised by another committee of Government and medical representatives.

THE GOVERNING BODY of the Imperial College of Science has awarded the Gas Light and Coke Co.'s Research Fellowship, of the value of £175 with a grant for research expenses, just established by the company for the purpose of encouraging experimental research in relation to carbonisation, gaseous fuels and combustion, to Mr. F. R. Weston, A.R.C.S., for "The Spectroscopic Investigation of the Flames of Carbon Monoxide and Hydrogen and matters cognate thereto." The trustees of the Beit Fellowships for Scientific Research have awarded a research fellowship to Mr. H. W. Buston B.Sc., D.I.C. (Biochemistry), for a continuation of his work on "Nitrogenous Metabolism in Plants" (renewal).

A COURSE IN ORGANIC CHEMISTRY, specially designed for science teachers in schools, will be one of the features of the Oxford summer meeting which begins on Friday, July 27, and ends on Thursday, August 16. A course of demonstrations and classes will be provided under the supervision of Dr. F. D. Chattaway, F.R.S., Fellow, Tutor, and Lecturer in Chemistry, at Queen's College. The Pro-Provost and Fellows of Queen's College will allow the use of their laboratory. The course will be arranged so as to give some insight into the principles of research in organic chemistry. As the accommodation is strictly limited, those who wish to take this course must notify the Secretary and obtain a special card of admission, for which there is no extra fee.

THE EMPIRE COTTON GROWING CORPORATION, after considering the necessity for organised research at the universities and colleges of Great Britain, has decided to offer retaining grants to certain universities where highy specialised research is carried on. The Cotton Corporation has offered to the Imperial College of Science and Technology, South Kensington, the sum of £1,000 a year for a period of five years from October 1, the money to be devoted to plant physiology and plant pathology in the Department of Botany. The offer has been accepted by the governing body, and the research work will be undertaken in the new botany building which was recently opened by the Duke of Devonshire, and to which the Rubber Growers' Association of the City of London subscribed approximately £30,000 about two years ago.

A MOSCOW REPORT states that a central buying organisation for dyestuffs has just been formed in Russia and will replace the various Government and trade institutions through which consumers have hitherto secured supplies. It is said that the demand for dyestuffs in Russia is rapidly increasing, and the authorities are anxious to begin the manufacture of colours in the country. Attempts in this direction have so far met with no success, it is said, owing to the German makers refusing to supply intermediates to Russians. By bringing the whole of the buying into the hands of a central department it is anticipated that more pressure can be brought to bear on foreign makers and that they can be induced to modify their policy with regard to intermediates. Before the war Russia was one of the most important markets for German dyestuffs.

THE INQUEST concluded on Saturday, July 21, on three men who were suffocated in a sump hole in a trench near a waste heap belonging to the Bleachers' Association at Warth Fold, Bury. Several witnesses were called, including the borough analyst, who said that owing to the long exposure the heat had considerably altered the composition of the heap. There would be large hollows or holes within the mass, where the drainage water had washed away the soluble compounds, and these would be filled with the sulphuretted hydrogen gas, ultimately dissolving in the subsequent water draining therefrom. The day of the accident was one of the hottest days in the year. The presence of the gas in the well was explained. It proceeded from the water draining from the tank or alkali waste close by, which, containing large quantities of gas and easily decomposable sulphides, and being assisted by the prevailing high temperature, contaminated the air of the well, whilst the absence of wind or other ventilating agency stopped the process of diffusion or dilution. The jury returned a verdict of "accidental death."

Overdraft to a Dye Company

IN the Court of Appeal on Tuesday Lords Justices Bankes, Atkin, and Younger dismissed an appeal by the plaintiffs in the action London Joint Stock City and Midland Bank, Ltd. *v.* McLeod and others, from the refusal of Mr. Justice Coleridge to enter judgment, after a trial with a special jury. The action was brought by the plaintiff bank against the executors of the late Lord Shrewsbury and against Sir Henry Bird and Mr. James Gibson to recover £25,000, with interest, which was alleged to be due from each of the defendants on a guarantee. The guarantee was stated to have been given to the bank for an overdraft made to the Aniline Dye and Chemical Co., Ltd., of which the late Lord Shrewsbury, Sir Henry Bird, and Mr. James Gibson were directors. The defendants did not admit that the late Lord Shrewsbury signed the document of guarantee, and they pleaded alternatively that they believed that when the signatures were attached to the document they were simply being asked for specimen signatures for the use of the bank with respect to the account of the Aniline Dye and Chemical Co., Ltd., of which the signatories were directors. They counterclaimed for a rectification of the alleged guarantee. The defendant, Mr. Gibson, made no appearance, and judgment was entered against him in default of appearance.

After a hearing which lasted several days, five questions were left to the jury. The jury were unable to agree, and Mr. Justice Coleridge discharged them. The plaintiffs appealed, and asked for judgment on the ground that even if all the questions had been answered by the jury in the way most favourable to the defendants, there was no evidence to support such answers.

In dismissing the appeal the Court of Appeal suggested that the case should take its ordinary course and be re-tried.

Chemical Matters in Parliament

Ruhr Occupation and British Trade

Mr. F. Gray (House of Commons, July 23) asked the Parliamentary Secretary to the Overseas Trade Department whether he had any information that the French authorities were releasing all goods consigned to British buyers from the Ruhr and seized by them in January last; and whether any compensation was to be paid to such British buyers for losses sustained by the detention.

Lieut.-Colonel Buckley said that he was informed that the issue of export licences for goods ordered in the Ruhr by British traders prior to February 1, in cases where the purchaser made application for a licence not later than June 30, was proceeding satisfactorily.

Oil Mill Workers' Overalls

Mr. Rhys Davies (House of Commons, July 23) asked the Home Secretary whether he would cause inquiries to be made into the operation of Order No. 959, factory and workshop welfare, in respect of the oil mill workers employed by Lever Brothers, in the Birkenhead area; whether he was aware that a claim made on behalf of such workers for protective clothing by way of overalls, agreed upon by employers and workpeople in the industry, had been ignored,

Mr. Bridgeman said that he had no information at present in regard to the matter. Inquiries would be made and the result communicated to Mr. Rhys Davies.

Trading Disputes

Captain Ainsworth (House of Commons, July 23) asked the Parliamentary Secretary to the Overseas Trade Department whether his Department had received, during the last six months, any instances of cancelled contracts between Chinese and British tracers and Japanese and British traders.

Lieut.-Colonel Buckley said that three cases had been brought to his notice in which disputes had arisen between British and Chinese or Japanese firms. Such matters were reported to him in confidence, and he regretted, therefore, he could not supply details of the points at issue.

Flour "Improvers"

Sir R. Blades (House of Commons, July 23) asked the Minister of Health whether the Committee he had appointed to inquire into the use of preservatives and colouring matters in food could have the terms of reference widened to include the use of improvers in flour, which would not come under the description of either preservatives or colouring matters.

Mr. Chamberlain said as at present advised he would hesitate to enlarge the terms of reference to this Committee as the scope of their inquiry was already extensive. He referred Sir Rowland to the Report issued by the Local Government Board in 1911 (Cd. 5613) on the bleaching of flour and the addition of so-called "improvers" to flour.

Industrial Alcohol

Mr. Hardie (House of Commons, July 18) asked the President of the Board of Trade whether, in view of the fact that we were dependent on outside sources for a supply of liquid fuel, he would consider the question of immediately developing the manufacture of industrial alcohol in this country.

Viscount Wolmer replied that investigations by the Fuel Research Board were still proceeding with a view to discovering a suitable method of manufacturing alcohol from materials available in this country, and in the Empire.

Mr. Hardie said that, as we could go on and make industrial alcohol, would his (Viscount Wolmer's) Department, in the interests of the trade of this country, see that the plant was allowed to work continuously instead of intermittently, and thereby make this country the equal of other countries in this respect.

Viscount Wolmer said that he was sorry to say that the Fuel Research Board did not agree with the views of Mr. Hardie.

Loss on Oil-Boring Schemes

Lieut.-Colonel G. R. Lane-Fox (Secretary of Mines) (House of Commons, July 24) informed Mr. Hannon that the approximate amount realised during the year ended March 31, 1923, by the disposal of Government buildings and plant utilised in the Government oil-boring experiment was £25,000. The amount reserved for interest on Exchequer advances and on administrative charges amounted on March 31, 1923, to £104,903. The total loss on the undertaking to that date, including such interest, was approximately £678,000.

Getting Trade in Europe*

By Sir Ernest Benn, Bt.

THE effect of public opinion upon trade, to make it good or bad, is far more powerful than is commonly realised. If we all make up our minds that things are going to be bad, then they will be bad; if we take a cheerful, optimistic view, the effect upon trade is always good. I want us to begin to think rather more kindly about Europe than we have been in the habit of doing. If that change were to be brought about, European trade would automatically begin to revive. The reconstruction of Europe will, of course, be helped by wise political arrangements, but all the politicians and all the trade agreements in the world will not make trade. Trade, which consists in exchanging manufactures and services, must be done by you and me.

If instead of relying entirely upon political speeches about Europe you take a map of the Continent and study it, a number of new thoughts may occur to you. To begin with, the Continent consists of thirty Sovereign States inhabited by between seven and eight hundred million human beings. Some of these people are not so well off as they might be, but they are living, and on the whole more or less enjoying life; they sleep, they feed, they wear clothes, they live in houses, they use furniture; they go to the theatre and the opera much more than we do, they are married and given in marriage, and indeed they act in much the same sort of way, day by day, and hour by hour, that you and I do. Every one of these little acts of every one of these seven hundred million European people means trade of some kind to somebody.

New Opportunities for Trade

The Americans are probably the only people outside of Europe who thoroughly understand the position. While the American Government declines to have anything to do with European politics, the American people, especially the business people, are swarming over the Continent, doing trade. While Europe consists of thirty Sovereign States, about a dozen of them are new. There are the Succession States, cut out of the old Austrian Empire, and then the Baltic States and Poland, taken out of the old Germany and the old Russia. Each of these places offers exceptional opportunity for British trade. It is easier to sell British goods in most of these places than it has ever been, and for reasons which are sufficiently obvious. Hungary is an agricultural country, and it requires manufactures of all kinds in exchange for its cereal products. Before the War the corn and grain of Hungary were exchanged for the manufactures of Bohemia, both places being within the old Empire, and each having every interest in trading with the other. Since the Peace Treaty Bohemia has become a separate State known by the rather difficult name of Czecho-Slovakia; the Czechs are now foreigners to the Hungarians where previously they were of the same nationality. This new condition has not promoted any love between the Czechs and the Hungarians, with the result that if an Englishman goes to Budapest and offers goods which have previously been bought in Bohemia, he will get the order every time.

Study Poland again. This great country, which eight years ago did not exist, has been made up, partly of Russia and partly of Germany. The Poles who years ago were Germans not unnaturally did the whole of their business with other Germans. Now, however, that they are Poles, and anxious to make it clear that they are not Germans, they are making every effort which is open to them to transfer their trade from German neighbours to other channels. From this it is easy to understand why the English business man is always so welcome when he summons up his courage and ventures into Poland. Similar considerations apply to Esthonia, Lithuania, Finland, Yugo-Slavia, and, perhaps the most important of all, to what remains of Austria herself.

Exchange and Credit Conditions

The difficulties in European trade arising from varying rates of exchange and falling currencies are, of course, serious, but they are not nearly so serious as they are commonly supposed to be. A falling currency often has exactly the opposite effect to that which is dictated by the economist. When the mark is likely to depreciate then the whole of people of Germany—seventy millions of them—rush to the shops and buy anything upon which they can lay their hands. Several English manufacturers who have understood the question have done exceedingly well in the last few years on the Continent. I only wish that more of them had had the same sense to take advantage of the opportunities that have arisen.

Another reason that is frequently given to me for failing to attempt business on the Continent is that credit must be given. There has been no such thing as credit in most of the Continental countries at any time since the Armistice. Before the war the habit of England was to lend money freely to the Continent, and indeed to foreign buyers in every part of the world, but you can only lend money when money is more or less a stable article with a certain amount of reliability.

This excuse about credit has, therefore, no foundation of fact in it. The impossibility of giving credit does undoubtedly cut out some classes of trade which cannot be done on a cash basis, but no Continental gives credit any longer to any other Continental. All business is transacted for cash between Germans and Austrians and Poles and Frenchmen, and there is therefore no longer any need, indeed any desire, for credit from the Englishmen.

Europe a Hundred Years Ago

I want to conclude with a suggestion which I think will appeal to you. It would be a very good thing if many of you were to consider spending your holidays on the Continent. If there are 200,000 listeners-in, and many of them would in the next few months cross the Channel, more would be done to solve the question of the restoration of Europe, and the revival of our own trade, than all the Acts of Parliament of a lifetime can accomplish. When you go get into touch with people in the same line of business as yourselves on some part of the Continent. They can easily be found. Your fellow-tradesmen in France or Hungary or Poland, or even in Germany will give you a better time than if you went into their town without their knowledge or without calling on them. I have never known an English business man make a serious tour on the Continent without coming back with inspirations and ideas and generally with orders. If you cannot sell, you can buy, and the one, of course, is just as important as the other. Europe a hundred years ago was ten times worse than it is to-day, and yet our grandfathers were then founding our position as the leaders of world trade. They found their opportunity in the difficulties of Europe, and if we have not altogether forgotten how to do business we ought to be able to repeat their triumphs.

* Notes of a "wireless talk" broadcast from the London Broadcasting Station.

Hydrogen Sulphide in Mines

HYDROGEN sulphide, called "stink-damp," from its odour, is usually a product of the decomposition of sulphide minerals in the presence of moisture, states the Department of the Interior, in Technical Paper 334, prepared by the United States Bureau of Mines. It may also be produced by the burning of black powder and other explosives. It has been found, though rarely, issuing with methane from gas blowers or feeders in coal mines. As little as 0·05 to 0·07 per cent. will sometimes cause death after long exposure, and 0·20 per cent. is fatal in a very few minutes. In work recently done at the Bureau of Mines experiment station at Pittsburgh canary birds were killed in about a quarter of a minute in 0·07 per cent., and overcome in less than 2 minutes in as little as 0·034 per cent.; white rats were overcome and killed by exposure to 0·08 per cent. in from 5 to 15 minutes. When mixed with seven times its volume of air, hydrogen sulphide is violently explosive.

Nauru Phosphates

THE British Phosphates Commission of Nauru, in its annual report for the year ended June, 1922, states that the tonnage of cargoes shipped was 360,000, of which Australia received 47 per cent., New Zealand 10½ per cent., Great Britain 4½, and other countries 38 per cent. All Empire demands were met at satisfactory prices, and the surplus was disposed of to foreign countries at market rates. The results of the first two years rendered possible substantial reductions in the selling price for the third year. The trading account shows a credit balance for the year of £91,000.

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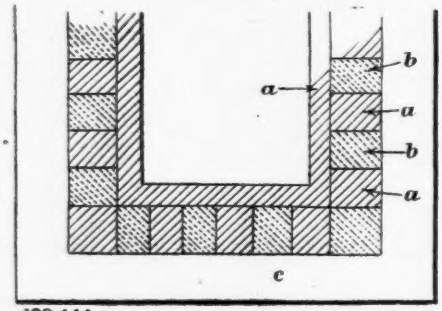
Abstracts of Complete Specifications

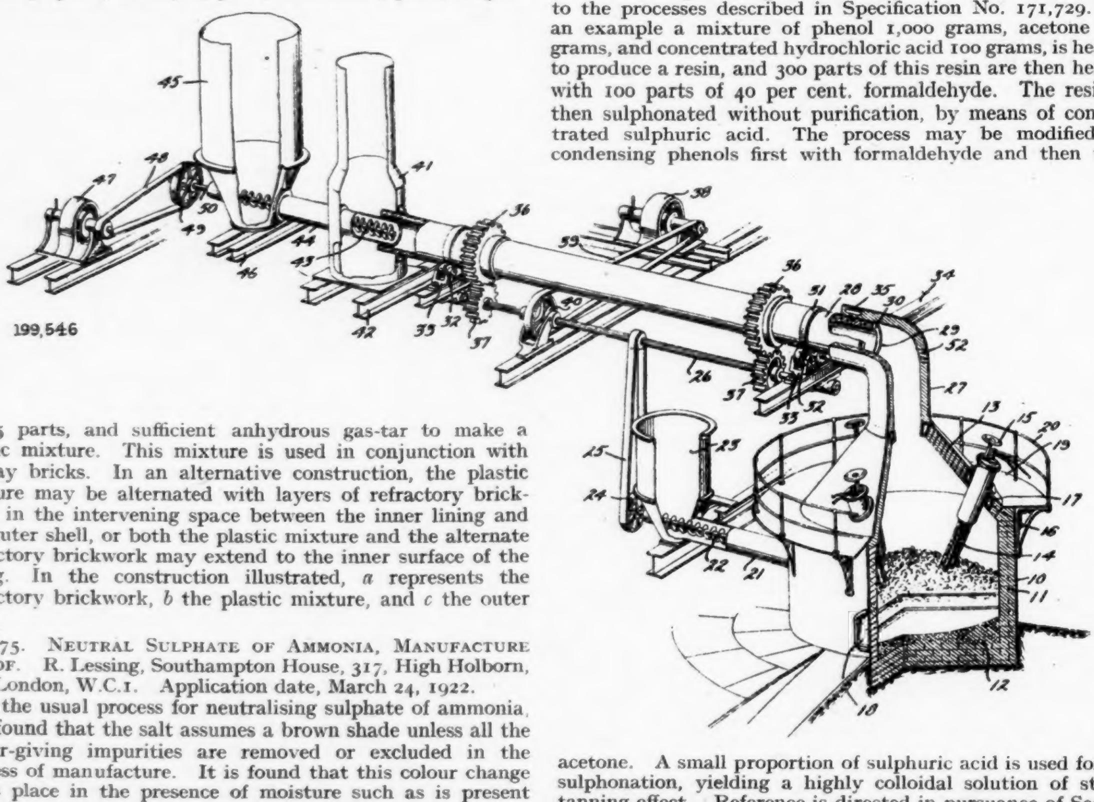
199,444. REFRACTORY LININGS FOR FURNACES AND THE PRODUCTION THEREOF. E. Cone, Greylands, Darlaston Road, Walsall, Stafford, and J. W. Hale, 39, Birmingham Road, West Bromwich, Stafford. Application date, March 17, 1922.

The object is to produce a cheaper and more durable refractory lining for furnaces, which is applicable to neutral, basic, or acid materials. A plastic mixture is introduced between an outer wall or shell and an inner refractory brick



199,444

lining, the plastic mixture being of such a character that it becomes assimilated or fused into the brickwork by the working heat of the furnace. As an example, a neutral lining for the hearth of a blast furnace may be composed of graphite 50 parts, fireclay 25 parts, silica rock 5 parts, magnesite 5 parts, and sufficient anhydrous gas-tar to make a plastic mixture. This mixture is used in conjunction with fireclay bricks. In an alternative construction, the plastic mixture may be alternated with layers of refractory brickwork in the intervening space between the inner lining and the outer shell, or both the plastic mixture and the alternate refractory brickwork may extend to the inner surface of the lining. In the construction illustrated, *a* represents the refractory brickwork, *b* the plastic mixture, and *c* the outer shell.



199,546

199,475. NEUTRAL SULPHATE OF AMMONIA, MANUFACTURE OF. R. Lessing, Southampton House, 317, High Holborn, London, W.C.1. Application date, March 24, 1922.

In the usual process for neutralising sulphate of ammonia, it is found that the salt assumes a brown shade unless all the colour-giving impurities are removed or excluded in the process of manufacture. It is found that this colour change takes place in the presence of moisture such as is present when the salt is treated with an excess of moist ammonia gas, or washed with ammoniacal or alkaline liquor. If ordinary sulphate of ammonia containing the usual impurities, including salts of iron, is dried and treated with a dry neutralising agent, practically no change of colour is produced. The same result is obtained if the salt is dried before sufficient of the neutralising agent has been added to effect complete neutralisation. In this process, it is necessary that the ammonium sulphate should be drier than can be obtained with a centrifugal machine or by drainage when cold, or at a higher temperature in the presence of steam. The moisture is preferably removed under the action of heat as described in Specification No. 141,787 (see THE CHEMICAL AGE, Vol. II, p. 591), and any of the solid neutralising agents may be used. If the proportion of free acid is excessive part may be neutralised before or during the removal of moisture, particularly where the reaction of the neutralising agent with the free acid or other impurities produces an appreciable amount of moisture. Sulphate of ammonia neutralised in this manner must subsequently be kept dry to avoid discoloration. The colour change produced depends on the amount of residual moisture in the salt, and this is found to apply to samples containing widely different amounts of colour-giving impurities.

199,528. TANNING AGENTS, MANUFACTURE OF. W. Moeller, 20, Bilhorner-Canal-strasse, Hamburg. Application date, April 7, 1922.

Specification No. 171,729 (see THE CHEMICAL AGE, Vol. V, p. 844) describes the production of tanning agents by the use of condensation products of phenols with formaldehyde in alkaline solution, various classes of aldehydes and phenols being used. The present invention employs another class of artificial resins obtained by substituting acetone for the formaldehyde, and condensing by means of acids or alkalies. These condensation products may be condensed to other substances of higher molecular weight by the addition of formaldehyde, using ammonia, salts of alkaline or acid reaction, amines and the like, as condensing agents. These artificial resins form the raw materials for making tanning agents, and the subsequent sulphonation may be carried out according to the processes described in Specification No. 171,729. In an example a mixture of phenol 1,000 grams, acetone 200 grams, and concentrated hydrochloric acid 100 grams, is heated to produce a resin, and 300 parts of this resin are then heated with 100 parts of 40 per cent. formaldehyde. The resin is then sulphonated without purification, by means of concentrated sulphuric acid. The process may be modified by condensing phenols first with formaldehyde and then with acetone. A small proportion of sulphuric acid is used for the sulphonation, yielding a highly colloidal solution of strong tanning effect. Reference is directed in pursuance of Section 7, Sub-section 4, of the Patents and Designs Acts, 1907 and 1919, to Specification 111,141.

199,546. ELECTRIC FURNACES. R. A. Driscoll, 218, Sixth Street, Antioch, Contia Costa, Cal., U.S.A. Application date, April 24, 1922.

The object is to enable ores such as iron ore to be reduced in an electric furnace, using an inferior grade of fuel for the

reduction. Such a furnace is particularly adapted for use in a district where electric power is cheap, and where iron ore and low grade coal are obtainable. In such cases the coal is often not of the type suitable for use for the manufacture of coke, which would be required in a blast furnace. The furnace 10 is lined with refractory material 11, and has a hearth 12 which may be acid, neutral or basic. Three electrodes 14 project through the roof of the furnace, and are adjustable axially by means of screws. The electrodes may be cooled by water conduits 17. The powdered fuel is supplied to the furnace from a hopper 23 by means of a screw conveyor 22 mounted in a tube 21. The roof of the furnace terminates in an opening communicating with a right-angled pipe 27, which supports one end of a rotary reduction furnace 28. The latter is supported by means of bearing rings 31 resting on rollers 32, and is rotated by means of spur gearing 36, 37. The driving shaft 26 is rotated by a motor 38, and also drives the conveyor 22. A charge of ore, slagging material and fuel is supplied from a hopper 45 to the furnace 28 by means of a conveyor 43. Compressed air is supplied to the furnace through a channel connected with tuyeres 52. The charge is fed continuously into the electric furnace from the rotary furnace 28, and receives an auxiliary supply of fuel above the top of the charge from the screw conveyor 22. A large volume of gas is generated from this fuel, and is partly burnt by means of air admitted at 52, so that the hottest zone of the reducing furnace 28 is at its lowest end. The carbon monoxide produced partly reduces the ore in the furnace 28, and decomposes the limestone, so that consumption of electricity in the furnace is reduced. The hot gases are cooled in passing through the furnace 28, and finally serve to dry the incoming material. The furnace is applicable also for the production of ferro-chrome, cupro-vanadium, cupro-manganese, ferro-vanadium, ferro-molybdenum, silico-chrome, ferro-titanium, and calcium carbide. The preliminary reduction effected by the hot gases in the furnace 28 reduces the consumption of electricity to about half that necessary in a reduction furnace. Further, it is possible to use low grade fuel such as slack coal, oil residue, etc. The furnace operates continuously, so that a uniform product is obtained. The furnace is not liable to interruption in working due to the formation of calcium carbide, graphite, carborundum, etc. The composition of the charge is readily controlled, so that the proportion of silicon and carbon in the reduced metal may be determined. The formation of nitrides of iron, which sometimes occurs in the blast furnace, may be avoided in the electric furnace by the elimination of nitrogen. It is possible also to use ores such as magnetites, which contain too much sulphur for blast furnace treatment.

199,575. CEMENT, PROCESS FOR THE MANUFACTURE OF. O. Nickel, Rathausmarkt, Muhlheim-Ruhr, Germany, and R. Markwitz, 46, Lotharstrasse, Duisburg, Germany. Application date, May 25, 1922.

The process is for the manufacture of cement from slag and other substances containing silicates, such as natural minerals and waste products. In the usual process for producing cement from furnace slag and slaked lime, the slag is used containing water as received from the granulating process, with the object of avoiding a drying process and to promote a reaction between the silicate and the quicklime due to the heat generated. In the present invention the furnace slag is mixed with burned unslaked lime, and ground in a dry condition to the fineness of cement. About 1–5 per cent. of gypsum may also be added to the cement mixture. In an example, the cement is obtained by grinding a mixture of water-granulated blast furnace slag well dried 80 parts, burnt hydraulic lime 16 parts, and gypsum 4 parts. This cement is of good keeping quality, which is dependent on the absence of any hydrates of lime. Reference is directed in pursuance of Section 7, Sub-section 4, of the Patents and Designs Acts, 1907 and 1919, to Specifications Nos. 11,948/1884, 5,412/1889, 19,467/1891, 4,594/1898, 1,438/1914, and in pursuance of Section 8, Sub-section 2, to Specification No. 187,362.

199,607. PURE SODIUM CHLORIDE, PROCESS FOR MANUFACTURING. J. T. Westermann, 71, Meentweg, Bussum, Holland. Application date, June 28, 1922.

The process is for obtaining pure sodium chloride from crude salt or from solutions of sea salt, rock salt, mine salt, or brine. Crude mineral salt usually contains as impurities the sulphates of calcium magnesium and sodium, the chlorides of magnesium and calcium, the carbonates of magnesium and calcium, as well as suspended impurities. In purifying salt the calcium sulphate only is usually removed, and there has been no simple process for removing the remaining impurities. It is now found that the calcium and magnesium compounds may all be precipitated by the addition of a mixture of a mono-hydrogen alkali phosphate, and an akali carbonate. The sodium salts are preferably used to avoid adding another metal, and after the precipitation of the impurities these additions add only sodium chloride and sodium sulphate to the solution. The impurities have thus been reduced to sodium sulphate only, and the solution is enriched with sodium chloride. The disodium hydrogen phosphate and sodium carbonate are used in molecular proportions, and the quantity to be added is determined by preliminary experiment. The sodium sulphate is then changed to an insoluble sulphate by adding barium chloride, and the precipitate is filtered off. The remaining solution contains sodium chloride only. The mixture of sodium phosphate and carbonate is added to the salt solution when boiling, and the boiling is continued for half an hour, when barium chloride is added. The purified sodium chloride obtained is particularly suitable for electrolytic processes, such as the production of metallic sodium, caustic soda, chlorine, hydrochloric acid, sodium chlorate, etc., and also in the manufacture of soap, since no insoluble calcium and magnesium soaps are produced. When used for the manufacture of soda, it is only necessary to apply the first part of this process since the presence of sodium sulphate is not a disadvantage. The precipitated impurities consist of calcium phosphate, magnesium phosphate and barium phosphate, and the separated and dried material may be used as a pigment. Alternatively, the calcium and magnesium phosphates may be converted into mono-hydrogen disodium phosphate for use again in the process, the barium sulphate remaining being used as a pigment. As an example, 100 parts of "refined" commercial salt required 1·6 parts of the mixed sodium phosphate and carbonate, and 2·2 parts of barium chloride for its purification.

199,667. DISSOCIATION OF ALUMINIFEROUS SUBSTANCES IN CONBINATION WITH FIXATION OF NITROGEN. V. Gerber, 5, Sihlquai, Zurich, Switzerland. Application date, November 3, 1922.

Aluminiferous substances such as bauxite or clay are fused with barium oxide or calcium oxide and carbonaceous substances. About 1–3 molecules of the alkaline earth oxide is used for each molecule of alumina, and other substances such as iron, iron ores or fluxes may also be added. The fusion may be effected in an electric furnace such as a carbide furnace, and yields a mixture of alkaline earth aluminate (barium aluminate), alkaline earth carbide (barium carbide), aluminium carbide, aluminium, or alloys with iron or alkaline earth metals. The product is finely pulverised and then treated with nitrogen while incandescent in closed ovens or furnaces of the type used for the production of calcium cyanamide. The reaction is exothermic and the heating is discontinued when the required temperature is reached. The product is a mixture of unaltered alkaline earth aluminate, alkaline earth cyanide, alkaline earth cyanamide, and aluminium nitride. This mixture is leached with water to dissolve out the aluminate and to expel the nitrogen as ammonia, or with solutions of alkali sulphate, carbonite or hydroxide at a temperature of 100° C. with or without pressure. The precipitated alkaline earth sulphate, carbonate or hydroxide may then be used again with fresh raw material. The aluminiferous material and the alkaline earth compound are preferably calcined separately to eliminate volatile material, and then mixed with the carbon, etc. In the known methods for the production of alumina, the raw material should not contain more than 5 per cent. of silica, to avoid loss of alkali, so that clay could not be used. In the present invention it is possible to use clay since all the ferric oxide and most of the silica are reduced and separate out as a ferro-silicon, which can be separated from the carbide-aluminate.

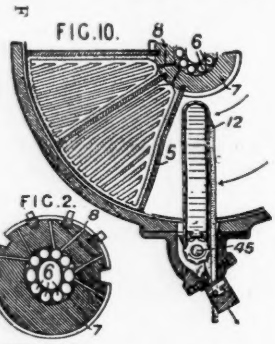
NOTE.—Abstracts of the following specifications, which are now accepted, appeared in THE CHEMICAL AGE when they became open to inspection under the International Convention:—173,750 (C.P. Byrnes) relating to partial combustion methods for treating aliphatic hydro-carbons, see Vol. VI. p. 353; 175,974 (Nihon Glycerine Kogyo Kabushiki Kaisha) relating

to manufacturing hydrocarbon oils from oils, fats, or fatty acids, see Vol. VI. p. 602; 177,807 (E. Merck, O. Wolfes, and H. Maeder) relating to nortropinone derivatives, see Vol. VI. p. 771; 181,009 (Soc. of Chemical Industry in Basle) relating to new carbonyl derivatives of α-naphthol, see Vol. VII., p. 213; 181,388 (Chemische Fabrik Griesheim Elektron) relating to production of basic magnesium carbonate, see Vol. VII., p. 249.

International Specifications not yet Accepted

197,910. FILTERING LIQUIDS. H. Jung, 28, Werderstrasse, Dahlem, Berlin. International Convention date, May 19, 1922.

A filter of the rotating disc type is built up of a number of sectors mounted on a shaft 7 between radial ribs 5. The sectors are connected by passages 8 with two series of pipes 6 in the hollow shaft 7. Each sector is thus placed in communication with the two series of pipes alternately. When a



197,910

filter-cake has formed on the outside of the sectors, a treating fluid is introduced through one series of pipes 6 into each alternate ring of sectors, so that it passes through the filter cake to the other rings of sectors. To remove the filter cake, claws 12 are attached to a chain passing round a driving wheel so that they are advanced into the casing while the filter elements are rotated. The filter cake is thus removed in strips. Alternatively, screw-operated mechanism may be provided to move the scrapers into the casing and withdraw them. A filter is also described having fixed square filtering elements which are connected with pressure and suction pipes alternately, while the scrapers reciprocate over the sides of the plates. The valves for supplying the material, for the treating and cleansing fluids, and for supplying pressure fluid to actuate the discharge devices may all be operated by an automatic pneumatic system.

197,932. DYES. H. Pereira, 3, Freyung, Vienna. International Convention date, May 18, 1922.

1 : 2-dioxyperylene is heated with sulphur, alkaline sulphides, or alkali hydroxides, and sulphur to produce a dye which dyes cotton brown to black shades from a hydrosulphide vat.

197,940. DYES. Durand and Huguenin Akt.-Ges., Basle, Switzerland. International Convention date, May 20, 1922.

A quinone dianilide obtained from one molecular proportion of chloranil and two molecular proportions of *p*-aminosalicylic acid or a homologue or derivative such as *p*-amino-*o*-cresotinic acid or nitroaminosalicylic acid, is warmed with concentrated sulphuric acid to produce benzoquinone dyes. In this reaction, the nitro-*p*-aminosalicylic acid may be replaced by the condensation product from non-nitrated *p*-aminosalicylic acid and chloranil, which is warmed with nitrosulphuric acid. Alternatively, the mixture may first be heated with sulphuric acid and then with nitrosulphuric acid-*p*-aminosalicylic acids are condensed with chloranil in aqueous suspension in presence of sodium acetate. These dyes give violet to blue shades on chrome-mordanted wool or cotton, by dyeing or printing.

197,952. ALUMINIUM ALLOYS. T. Goldschmidt Akt.-Ges., 18, Salkenbergsweg, Essen, Germany. International Convention date, May 20, 1922.

An earthy material is electrolysed in a bath of molten fluoride to produce an aluminium alloy containing silicon. If the silicon is not present in sufficient quantity in the material it may be added in the form of silicon fluoride or silica. Alternatively, the alloy may be obtained by fusing aluminium or an aluminium alloy with a silico-fluoride. These alloys have great strength and ductility.

LATEST NOTIFICATIONS.

200,788–9. Process for the vulcanisation of rubber and the like. Naugatuck Chemical Co. July 13, 1922.

200,806. Process for the production of disinfectant, therapeutically effective iodine preparations. Truttwin, H. July 17, 1922.

200,810. Process of producing amino benzoyl derivatives of 1-methyl-4-diethylamino pentanol-5 and 2-methyl-4-dimethylamino pentanol-5. Chemische Fabrik Flora. July 14, 1922.

200,815. Manufacture of cellulose ethers. Lilienfeld, Dr. L. July 13, 1922.

200,816. Process of preparing alkali celluloses. Lilienfeld, L. July 13, 1922.

200,827. Process of preparing low water content alkali cellulose. Lilienfeld, L. July 13, 1922.

200,834. Process of preparing cellulose ethers. Lilienfeld, Dr. L. July 13, 1922.

200,838. Electrodes for electrolytic cells. Electro Chemical Co. July 15, 1922.

Specifications Accepted, with Date of Application

179,544. Salts of urea, more especially of nitrate of urea, starting from cyanamides, Process for the manufacture of. Soc. d'Etudes Chimiques pour l'Industrie. May 3, 1921.

182,101. Water gas, Process of producing. Trent Process Corporation. June 21, 1921.

187,607. Electrolysis of metals, Apparatus for. A. Cremer. Oct 18, 1921.

200,118. Petroleum, Distillation of. M. Simonoff, M. Beninson, and F. Cros. January 4, 1921.

200,138. Mixing and beating lquids and semi-liquid substances. R. H. Morton. March 6, 1922.

200,151. Thymol, Manufacture of. Howards and Sons, Ltd., and J. W. Blagden. March 10, 1922.

200,160. Cellulose derivatives and fibrous products. Manufacture of. Plauson's (Parent Co.), Ltd., (*H. Plauson*). March 31, 1922.

200,167. Chemical reduction of organic compounds. W. G. Adam, N. E. Siderfin, D. G. Murdoch, and W. L. Galbraith. April 3, 1922.

200,175. Detergent compound, and method of making the same. F. H. Guernsey and Electric Smelting and Aluminium Co. April 4, 1922.

200,176. Production, mixing, blending, or refining of food products containing fats. J. W. Spensley and Chemical Enginering Co. (Manchester), Ltd. April 4, 1922.

200,186. Cellulose acetates, Manufacture of. J. O. Zdanowich. April 5, 1922.

200,203. Tanning extracts, Manufacture of. T. Redfern and W. Walker and Sons, Ltd. April 8, 1922.

200,262. Tanning agents, Manufacture and application of vegetable, mineral, and artificial. W. Moeller. April 27, 1922.

200,311. Magnesian cement. Method for the manufacture of. J. Sperni. May 30, 1922.

200,370. Softening water, Product or composition for. F. H. Lecomte. July 14, 1922.

200,376. Electrolysis of water, Apparatus for. L. Casale. July 19, 1922.

200,408. Electrolytic manufacture of lead alloys. W. Mathesius. September 14, 1922.

Applications for Patents

Battiscombe, C. A. Apparatus for drying china clay, argillaceous material, and asphaltum. 18,771. July 21.

Carbide and Carbon Chemicals Corporation and Marks, E. C. R. Purifying chlorine, etc. 18,362. July 16.

Davies, W. E. Carbonisation, gasification, or distillation of fuels, etc. 18,813–4. July 21.

Electro Chemical Co. Electrodes for electrolytic cells. 18,359. July 16. (United States, July 15, 1922.)

Empson, A. W. Centrifugal purifying and dehydrating apparatus. 18,817. July 21.

Forward, G. F., Taplay, J. G., and United Kingdom Oil Co., Ltd. Treatment and conversion of hydrocarbons. 18,485. July 17.

Jackson, W. J. Mellersh- and Ostro-Products Corporation of America. Manufacture of medical preparations containing arsenic. 18,573. July 18.

Jackson, W. J. Mellersh- and Ostro-Products Corporation of America. Manufacture of paraoxymetanitrophenyl-arsenious acid. 18,574. July 18.

Kilby, W. Dyeing cellulose-acetate fibres. 18,270. July 16.

Naugatuck Chemical Co. Process for halogenating latex, etc. 18,439. July 17. (United States, August 3, 1922.)

Shimadzu, G. Manufacture of powder of lead suboxide intermingled with powder of metallic lead. 18,552. July 18.

Tarassoff, K. Manufacture of hard condensation products, liquid varnishes, soluble tars, etc. 18,586. July 18.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

London, July 26, 1923.

BUSINESS remains quiet and the influence of the holiday season is apparent, apart from the general stagnation in trade.

There is no point of special interest. Export inquiry is poor, and the actual business passing is comparatively small.

General Chemicals

ACETONE is practically unobtainable on the spot, and supplies are very scarce for delivery over the next few months.

ACID ACETIC is a very firm market, and on the resumption of business in the industrial districts spot supplies are likely to be short. The demand in other directions is quite satisfactory.

ACID CITRIC is unchanged.

ACID FORMIC is without special feature.

ACID OXALIC.—The downward trend of price seems to have been arrested, but there is comparatively little business moving.

BARIUM CHLORIDE.—The demand is only nominal.

BLEACHING POWDER.—There has been a fair demand; price unchanged.

CREAM OF TARTAR.—Very firm and supplies for early delivery are light.

FORMALDEHYDE is practically unobtainable for early delivery, and makers are not keen on selling forward, owing to the uncertain situation.

LEAD ACETATE has been in much better demand and price is firm.

LITHOPONE is in fair demand, and unchanged in price.

MAGNESIUM CHLORIDE.—Foreign makers have advanced their price. Secondhand supplies are limited.

CAUSTIC POTASH.—Unchanged.

POTASSIUM PRUSSIATE.—Unchanged.

SODIUM ACETATE.—Very firm with little available.

SODIUM BICHROMATE.—Unchanged.

SODIUM NITRATE.—Unchanged.

SODIUM PHOSPHATE.—Unchanged.

SODIUM PRUSSIATE is again slightly weaker in price, with almost complete absence of demand.

SODIUM SULPHIDE.—Unchanged.

ZINC OXIDE.—Unchanged.

Pharmaceutical Chemicals

ACETYL SALICYLIC ACID.—Smaller demand. Prices for the leading makes are unchanged.

ACID LACTIC.—Some inquiry, and a fair business is reported.

ACID SALICYLIC.—Easier in sympathy with carbolic acid.

BROMIDES.—Poor demand, substantially unchanged.

COCAINE.—Very firm.

EUCALYPTUS OIL.—Firm, stocks apparently not being large.

HEXAMINE.—Inclined to weaken in consequence of Continental offers.

METHYL SALICYLATE.—There is more inquiry, especially for export. Values are unchanged.

PHENACETIN.—Spot parcels offered by weak holders have brought about a temporarily easier market.

SODA SALICYLATE.—Easy; in some directions lower prices are quoted.

VANILLIN.—Unchanged.

Coal Tar Intermediates

There is nothing of singular interest to report during the past week, but a fair number of sales have been made, and buyers continue to demand various particular lines.

ALPHA NAPHTHOL continues in short supply, and fair inquiries have been received.

ALPHA NAPHTHYLAMINE has been a fair home trade at recent values.

ANILINE OIL AND SALT continue to pass steadily into consumption, and Continental buyers have been interested in both materials.

BENZIDINE BASE is quiet.

BENZIDINE SULPHATE has been inquired for on home trade account.

CROCEINE ACID has been the object of some small interest.

DIMETHYLANILINE.—Home orders have been booked.

DIPHENYLAMINE.—Both home and export buyers are in the market, and this product is very firm.

ORTHONITROTOLUENE.—Some small inquiries have been received.

PARAPHENYLEMEDIAMINE.—Export buyers are interested.

RESORCIN is quiet.

XYLIDINE is without special feature.

Coal Tar Products

The market is somewhat dull, with little fresh business passing.

90% BENZOL.—Despite the fall in the advertised price of the National Benzol Co.'s product, 90% Benzol appears to maintain its price of 1s. 6d. per gallon on rails, although a sympathetic fall in value is not improbable.

PURE BENZOL is in poor demand, and is worth about 2s. per gallon on rails in the North, and 2s. 2d. to 2s. 3d. per gallon in London.

CREOSOTE OIL is steady, without change in price, and is worth 8¼d. to 8⅝d. per gallon in the North, and 9¼d. to 9½d. in the South.

CRESYLIC ACID is worth about 2s. 1d. per gallon on rails for the pale quality, 97/99%, while the dark quality, 95/97%, is quoted at 1s. 9d. to 1s. 10d. per gallon on rails.

SOLVENT NAPHTHA has no market, and is nominally worth 1s. 3d. per gallon.

HEAVY NAPHTHA is also plentiful at 1s. 5d. to 1s. 6d. per gallon on rails.

NAPHTHALENES are inactive, with little demand, the lower qualities being worth £6 to £6 10s. per ton, while 74/76 and 76/78 qualities are worth £9 to £9 10s. per ton.

PITCH.—The market is quiet and quotations are: London, 147s. 6d. to 150s. f.o.b.; East Coast, 145s. to 150s. f.o.b.

Sulphate of Ammonia

The demand for home and export is quiet and prices are easier.

[*Current Market Prices on following pages.*]

Chemical Use for Waste Products

AN example of the chemist's services in the commercial utilisation of waste products is furnished by Sir Frederick Becker, the chairman of several paper-making companies, who states that a scheme is proceeding for converting the waste products of Canadian wheat lands into material for paper-making. Under a new chemical process of treatment, known as the De Vains process, the fibre is first gently boiled in soda ash, treated with bleach, washed, treated with soda again, and finally treated with bleach. It is said to come out a perfect product, ready to make the highest grades of paper. The new plant, which will be worked at Northfleet, Kent, by a small company, will, it is hoped, be at work early in January. Esparto and other home fibres as well as straw are to be treated. Any definite results are to be first submitted to the Canadian Government.

Explosibility of Ammonium Nitrate

THE Department of the Interior, U.S.A., in co-operation with the National Research Council, has conducted a series of tests at the Pittsburgh experiment station of the Bureau of Mines to determine the explosibility of ammonium nitrate from the following standpoints: The thermal decomposition of ammonium nitrate, the influence of confinement upon the explosibility of ammonium nitrate, and the influence of density upon the explosibility of ammonium nitrate. The influence of nitrous oxide atmospheres upon the sensitiveness of ammonium nitrate to detonation is now being investigated.

Current Market Prices

General Chemicals

	Per	£	s.	d.		£	s.	d.
Acetic anhydride, 90–95%	lb.	0	1	4	to	0	1	5
Acetone oil	ton	90	0	0	to	95	0	0
Acetone, pure	ton	122	10	0	to	125	0	0
Acid, Acetic, glacial, 99–100%	ton	71	0	0	to	72	0	0
Acetic, 80% pure	ton	50	0	0	to	51	0	0
Acetic, 40% pure	ton	25	0	0	to	26	0	0
Arsenic, liquid, 2000 s.g.	ton	88	0	0	to	90	0	0
Boric, commercial	ton	50	0	0	to	55	0	0
Carbolic, cryst. 39–40%	lb.	0	1	5	to	0	1	5½
Citric	lb.	0	1	8	to	0	1	8½
Formic, 80%	ton	50	0	0	to	51	0	0
Hydrofluoric	lb.	0	0	7½	to	0	0	8½
Lactic, 50 vol.	ton	36	0	0	to	38	0	0
Lactic, 60 vol.	ton	42	0	0	to	44	0	0
Nitric, 80 Tw.	ton	27	0	0	to	28	0	0
Oxalic	lb.	0	0	6¼	to	0	0	6¾
Phosphoric, 1.5	ton	35	0	0	to	38	0	0
Pyrogallic, cryst.	lb.	0	5	9	to	0	6	0
Salicylic, technical	lb.	0	1	9	to	0	2	0
Sulphuric, 92–93%	ton	6	0	0	to	7	0	0
Tannic, commercial	lb.	0	2	3	to	0	2	9
Tartaric	lb.	0	1	5	to	0	1	5½
Alum lump	ton	12	10	0	to	13	0	0
Chrome	ton	28	0	0	to	29	0	0
Alumino ferric	ton	7	0	0	to	7	5	0
Aluminium, sulphate, 14–15%	ton	8	10	0	to	9	0	0
Sulphate, 17–18%	ton	10	10	0	to	11	0	0
Ammonia, anhydrous	lb.	0	1	6	to	0	1	8
.880	ton	32	0	0	to	34	0	0
.920	ton	22	0	0	to	24	0	0
Carbonate	ton	32	15	0			—	
Chloride	ton	50	0	0	to	55	0	0
Muriate (galvanisers)	ton	35	0	0	to	37	10	0
Nitrate (pure)	ton	35	0	0	to	40	0	0
Phosphate	ton	65	0	0	to	68	0	0
Sulphocyanide, commercial 90%	lb.	0	1	1	to	0	1	3
Amyl acetate, technical	ton	225	0	0	to	260	0	0
Arsenic, white powdered	ton	73	0	0	to	75	0	0
Barium, carbonate, Witherite	ton	5	0	0	to	6	0	0
Carbonate, Precip.	ton	15	0	0	to	16	0	0
Chlorate	ton	65	0	0	to	70	0	0
Chloride	ton	15	10	0	to	16	0	0
Nitrate	ton	33	0	0	to	35	0	0
Sulphate, blanc fixe, dry	ton	20	10	0	to	21	0	0
Sulphate, blanc fixe, pulp	ton	10	5	0	to	10	10	0
Sulphocyanide, 95%	lb.	0	0	11	to	0	1	0
Bleaching powder, 35–37%	ton	10	7	6	to	10	17	6
Borax crystals	ton	27	0	0	to		—	
Calcium acetate, Brown	ton	11	10	0	to	12	0	0
Grey	ton	19	15	0	to	20	0	0
Carbide	ton	16	0	0	to	17	0	0
Chloride	ton	5	15	0	to	6	0	0
Carbon bisulphide	ton	35	0	0	to	40	0	0
Casein technical	ton	100	0	0	to	105	0	0
Cerium oxalate	lb.	0	3	0	to	0	3	6
Chromium acetate	lb.	0	1	1	to	0	1	3
Cobalt acetate	lb.	0	6	0	to	0	6	6
Oxide, black	lb.	0	9	6	to	0	10	0
Copper chloride	lb.	0	1	1	to	0	1	2
Sulphate	ton	27	0	0	to	28	0	0
Cream Tartar, 98–100%	ton	90	0	0	to	92	10	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde, 40% vol.	ton	97	10	0	to	98	0	0
Formusol (Rongalite)	lb.	0	2	1	to	0	2	2
Glauber salts, commercial	ton	4	10	0	to	5	0	0
Glycerin crude	ton	65	0	0	to	67	10	0
Hydrogen peroxide, 12 vols.	gal	0	2	2	to	0	2	3
Iron perchloride	ton	18	0	0	to	20	0	0
Sulphate (Copperas)	ton	3	10	0	to	4	0	0
Lead acetate, white	ton	43	0	0	to	45	0	0
Carbonate (White Lead)	ton	43	0	0	to	45	0	0
Nitrate	ton	44	10	0	to	45	0	0
Litharge	ton	37	0	0	to	39	0	0
Lithophone, 30%	ton	22	10	0	to	23	0	0
Magnesium chloride	ton	4	5	0	to	4	10	0
Carbonate, light	cwt.	2	10	0	to	2	15	0
Sulphate (Epsom salts commercial)	ton	6	10	0	to	7	0	0
Sulphate (Druggists')	ton	10	0	0	to	11	0	0
Manganese Borate, commercial	ton	65	0	0	to	75	0	0
Sulphate	ton	45	0	0	to	50	0	0
Methyl acetone	ton	78	0	0	to	80	0	0
Alcohol, 1% acetone	ton	105	0	0	to	110	0	0
Nickel sulphate, single salt	ton	38	0	0	to	39	0	0
Ammonium sulphate, double salt	ton	38	0	0	to	39	0	0
Potash, Caustic	ton	35	0	0	to	36	0	0
Potassium bichromate	lb.	0	0	5½	to	0	0	6
Carbonate, 90%	ton	31	0	0	to	32	0	0
Chloride, 80%	ton	9	0	0	to	10	0	0
Chlorate	lb.	0	0	3½	to		—	
Metabisulphite, 50–52%	ton	65	0	0	to	70	0	0
Nitrate, refined	ton	38	0	0	to	40	0	0
Permanganate	lb.	0	0	10	to	0	0	10½
Prussiate, red	lb.	0	3	0	to	0	3	2
Prussiate, yellow	lb.	0	1	3	to	0	1	3½
Sulphate, 90%	ton	10	10	0	to	11	0	0
Salammoniac, firsts	cwt.	3	3	0	to		—	
Seconds	cwt.	3	0	0	to		—	
Sodium acetate	ton	25	0	0	to	25	10	0
Arsenate, 45%	ton	45	0	0	to	48	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	0	4½	to	0	0	4¾
Bisulphite, 60–62%	ton	21	0	0	to	23	0	0
Chlorate	lb.	0	0	3	to	0	0	3¼
Caustic, 70%	ton	19	10	0	to	20	0	0
Caustic, 76%	ton	20	10	0	to	21	0	0
Hydrosulphite, powder	lb.	0	1	5	to	0	1	6
Hyposulphite, commercial	ton	10	10	0	to	11	0	0
Nitrite, 96–98%	ton	27	10	0	to	28	0	0
Phosphate, crystal	ton	16	0	0	to	16	10	0
Perborate	lb.	0	1	0	to	0	1	1
Prussiate	lb.	0	0	6¾	to	0	0	7
Sulphide, crystals	ton	8	10	0	to	9	0	0
Sulphide, solid, 60–62 %	ton	14	10	0	to	15	10	0
Sulphite, cryst.	ton	11	10	0	to	12	0	0
Strontium carbonate	ton	50	0	0	to	55	0	0
Nitrate	ton	50	0	0	to	55	0	0
Sulphate, white	ton	6	10	0	to	7	10	0
Sulphur chloride	ton	25	0	0	to	27	10	0
Flowers	ton	11	0	0	to	11	10	0
Roll	ton	9	15	0	to	10	10	0
Tartar emetic	lb.	0	1	2	to	0	1	3
Tin perchloride, 33%	lb.	0	1	1	to	0	1	2
Perchloride, solid	lb.	0	1	3	to	0	1	4
Protochloride (tin crystals)	lb.	0	1	4	to	0	1	5
Zinc chloride 102° Tw.	ton	20	0	0	to	21	0	0
Chloride, solid, 96–98%	ton	25	0	0	to	30	0	0
Oxide, 99%	ton	42	0	0	to	45	0	0
Dust, 90%	ton	50	0	0	to	55	0	0
Sulphate	ton	15	0	0	to	16	0	0

Pharmaceutical Chemicals

	Per	£	s.	d.		£	s.	d.
Acetyl salicylic acid	lb.	0	3	3	to	0	3	6
Acetanilid	lb.	0	1	6	to	0	1	9
Acid, Gallic, pure	lb.	0	3	0	to	0	3	3
Lactic, 1.21	lb.	0	2	0	to	0	2	6
Salicylic, B.P.	lb.	0	2	0	to	0	2	3
Tannic, leviss.	lb.	0	3	3	to	0	3	6
Amidol	lb.	0	7	9	to	0	8	3
Amidopyrin	lb.	0	13	0	to	0	13	3
Ammon ichthosulphonate	lb	0	1	10	to	0	2	0
Barbitone	lb.	1	1	0	to	1	3	0
Beta naphthol resublimed	lb	0	1	9	to	0	2	0
Bromide of ammonia	lb	0	0	7	to	0	0	7½
Potash	lb.	0	0	6½	to	0	0	7
Soda	lb.	0	0	7½	to	0	0	8
Caffeine, pure	lb	0	10	9	to	0	11	0
Calcium glycerophosphate	lb.	0	5	9	to	0	6	0
Lactate	lb.	0	1	10	to	0	2	0
Calomel	lb.	0	4	9	to	0	5	0
Chloral hydrate	lb.	0	3	10½	to	0	4	0
Cocaine alkaloid	oz.	0	17	3	to	0	17	9
Hydrochloride	oz.	0	14	6	to	0	15	0
Corrosive sublimate	lb.	0	4	0	to	0	4	3
Eucalyptus oil, B.P. (70–75% eucalyptol)	lb.	0	1	10	to	0	1	11
B.P. (75–80% eucalyptol)	lb.	0	1	11	to	0	2	0
Guaiacol carbonate	lb.	0	8	9	to	0	9	0
Liquid	lb.	0	9	6	to	0	10	0
Pure crystals	lb.	0	9	6	to	0	9	9
Hexamine	lb.	0	3	10	to	0	4	0
Hydroquinone	lb.	0	3	6	to	0	3	9
Lanoline anhydrous	lb.	0	0	7	to	0	0	7½
Lecithin ex ovo	lb.	0	17	6	to	0	19	0
Lithi carbonate	lb.	0	9	6	to	0	10	0
Methyl salicylate	lb.	0	2	3	to	0	2	6
Metol	lb.	0	10	6	to	0	11	6
Milk sugar	cwt.	4	2	6	to	4	5	0
Paraldehyde	lb.	0	1	6	to	0	1	9
Phenacetin	lb.	0	6	0	to	0	6	3
Phenazone	lb.	0	7	3	to	0	7	6
Phenolphthalein	lb.	0	6	9	to	0	7	0
Potassium sulpho guaiacolate	lb.	0	5	0	to	0	5	3
Quinine sulphate, B.P.	oz.	0	2	3			—	

	Per	£	s.	d.		£	s.	d.
Resorcin, medicinal	lb.	0	5	6	to	0	5	9
Salicylate of soda powder	lb.	0	2	6	to	0	2	9
Crystals	lb.	0	2	9	to	0	3	0
Salol	lb.	0	2	9	to	0	3	0
Soda Benzoate	lb.	0	2	6	to	0	2	9
Sulphonal	lb.	0	14	6	to	0	15	0
Terpene hydrate	lb.	0	1	9	to	0	2	0
Theobromine, pure	lb.	0	10	6	to	0	11	0
Soda salicylate	lb.	0	7	9	to	0	8	0
Vanillin	lb.	1	3	0	to	1	4	0

Coal Tar Intermediates, &c.

	Per	£	s.	d.		£	s.	d.
Alphanaphthol, crude	lb.	0	2	0	to	0	2	3
Refined	lb.	0	2	6	to	0	2	9
Alphanaphthylamine	lb.	0	1	6	to	0	1	7
Aniline oil, drums extra	lb.	0	0	9	to	0	0	9½
Salts	lb.	0	0	9½	to	0	0	10
Anthracene, 40–50%	unit	0	0	8½	to	0	0	9
Benzaldehyde (free of chlorine)	lb.	0	2	6	to	0	2	9
Benzidine, base	lb.	0	4	9	to	0	5	0
Sulphate	lb.	0	3	9	to	0	4	0
Benzoic acid	lb.	0	2	0	to	0	2	3
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol	lb.	0	1	1	to	0	1	2
Betanaphthylamine, technical	lb.	0	4	0	to	0	4	3
Croceine Acid, 100% basis	lb.	0	3	3	to	0	3	6
Dichlorbenzol	lb.	0	0	9	to	0	0	10
Diethylaniline	lb.	0	4	6	to	0	4	9
Dinitrobenzol	lb.	0	1	1	to	0	1	2
Dinitrochlorbenzol	lb.	0	0	11	to	0	1	0
Dinitronaphthalene	lb.	0	1	4	to	0	1	5
Dinitrotoluol	lb.	0	1	4	to	0	1	5
Dinitrophenol	lb.	0	1	6	to	0	1	7
Dimethylaniline	lb.	0	2	9	to	0	3	0
Diphenylamine	lb.	0	3	6	to	0	3	9
H-Acid	lb.	0	5	0	to	0	5	3
Metaphenylenediamine	lb.	0	4	0	to	0	4	3
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	5	9	to	0	6	0
Metatoluylenediamine	lb.	0	4	0	to	0	4	3
Monosulphonic Acid (2.7)	lb.	0	8	6	to	0	9	6
Naphthionic acid, crude	lb.	0	2	3	to	0	2	6
Naphthionate of Soda	lb.	0	2	5	to	0	2	6
Naphthylamin-di-sulphonic-acid	lb.	0	4	0	to	0	4	3
Nevill Winther Acid	lb.	0	7	3	to	0	7	9
Nitrobenzol	lb.	0	0	7	to	0	0	8
Nitronaphthalene	lb.	0	0	11½	to	0	1	0
Nitrotoluol	lb.	0	0	8	to	0	0	9
Orthoamidophenol base	lb.	0	12	0	to	0	12	6
Orthodichlorbenzol	lb.	0	1	0	to	0	1	1
Orthotoluidine	lb.	0	0	10	to	0	0	11
Orthonitrotoluol	lb.	0	0	3	to	0	0	4
Para-amidophenol base	lb.	0	8	6	to	0	9	0
Hydrochlor	lb.	0	7	6	to	0	8	0
Paradichlorbenzol	lb.	0	0	6	to	0	0	7
Paranitraniline	lb.	0	2	7	to	0	2	9
Paranitrophenol	lb.	0	2	3	to	0	2	6
Paranitrotoluol	lb.	0	2	9	to	0	3	0
Paraphenylenediamine, distilled	lb.	0	12	0	to	0	12	6
Paratoluidine	lb.	0	5	6	to	0	5	9
Phthalic anhydride	lb.	0	2	6	to	0	2	9
Resorcin, technical	lb.	0	4	0	to	0	4	3
Sulphanilic acid, crude	lb.	0	0	10	to	0	0	11
Tolidine, base	lb.	0	7	3	to	0	7	9
Mixture	lb.	0	2	6	to	0	2	9

Essential Oils and Synthetics

Essential Oils.

		£	s	d
Anise	cheaper and dull, c.i.f. 1/9 spot	0	1	11
Bay		0	12	0
Bergamot		0	12	0
Cajaput	cheaper	0	3	6
Camphor, white	per cwt.	4	0	0
Brown	,,	3	15	0
Cassia	cheaper, c.i.f. 10/- spot	0	12	0
Cedarwood		0	1	4½
Citronella (Ceylon)		0	3	6
(Java)		0	4	2
Clove		0	7	0
Eucalyptus	very firm	0	1	10
Geranium Bourbon		1	10	0
Lavender		0	12	6
Lavender spike		0	3	0
Lemon		0	3	0
Lemongrass	per oz.	0	0	2½
Lime (distilled)		0	4	0
Orange sweet (Sicilian)		0	13	6
(West Indian)		0	10	6
Palmarosa		1	0	0
Peppermint (American)		0	13	0
Mint (dementholised Japanese)		0	7	0
Patchouli		1	12	0
Otto of Rose	dearer, per oz.	1	8	0
Rosemary		0	1	8
Sandalwood		1	6	0
Sassafras		0	5	6
Thyme	2/6 to	0	8	0

Synthetics.

	£	s.	d.
Benzyl acetate	0	3	0
Benzoate	0	3	0
Citral	0	10	0
Coumarine	0	18	6
Heliotropine	0	7	6
Ionone	1	5	0
Linalyl acetate	1	2	6
Methyl salicylate	0	2	6
Musk xylol	0	10	9
Terpeniol	0	3	0

Major and Co.'s Chemical Products

A Tribute to the Chemical Staff

At the ordinary general meeting of Major and Co., Ltd., at Hull on Thursday, July 19, the Chairman (Mr. J. L. Major), referred to the difficulties caused by the rising prices of tar, and added that the French occupation of the Ruhr had upset all calculations. Their Solignum business continued to flourish, but the high prices of raw material had acted to their disadvantage. They sometimes received complaints that the price of Solignum was too high. Their prices were based on a very small margin of profit and they could not possibly supply this high grade article at a price of a low-grade material. They supplied enormous quantities, running into millions of gallons, of creosote, a comparatively cheap wood preservative, and supplied it even in competition with Solignum to those whose demand was for cheapness first and quality afterwards. Solignum was made in eighteen colours, and many beautiful results in staining could be obtained both for inside and outside work. Their dye department had been a very serious cause of anxiety, but they saw a good time coming. They had confined themselves to a limited range of pigment colours. The quality was excellent and the effort and expenditure put into this department would reap the reward. He wished to give a word of praise to the chemists who had looked after this department. It was very galling to a zealous staff to know that all their efforts resulted only in loss to the firm, and it required considerable grit on their part to carry on cheerfully and hopefully. All the indications were that in a very short time they would be well above that datum line which was being so anxiously watched. He believed that there was a good future in front of the British dye trade if the Government continued with the very necessary though tardy support now given by the Dyestuffs Act. It would be a shameful thing if all the money and brains poured forth to establish the industry in this country were wasted by a return to unrestricted imports, under the conditions prevailing in Europe to-day. When working conditions again became normal—it seemed a very far-away proposition at present—he would have no fear of fair German or any other competition.

They had reconstituted their Tarslag business as a public company, and Major's share interest in the Tarslag Company would turn out to be a very satisfactory holding. The quality of material supplied by Tarslag had given the greatest satisfaction, and the company had an excellent name for good material and good work. He mentioned at the last annual meeting the consolidation of their tar interests in the Midlands. This continued, and a closer amalgamation was likely to take place shortly.

Their patent continuous still had now been adopted as far as possible for all their distillation purposes, and gave a considerable economy. They had not pushed it outside to any extent, as they wished to gather all the experience and information regarding it in their own works so that they could offer a perfect plant elsewhere. The still was patented in various foreign countries, including the United States. They had enquiries for the plant from the United States, and there were people there anxious to take it up.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to* THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.

Glasgow, July 25, 1923.

ONLY a moderate amount of business has been put through during the past week. A number of works are still closed for holidays, however, and an improvement is hoped for as soon as the restart is general.

Numerous Continental quotations continue to be received, and prices on the whole are steady.

Industrial Chemicals

ACID ACETIC, GLACIAL, 98/100%, £60 to £70 per ton. 80% pure, £49 to £51 per ton. 80% technical, £46 to £48 per ton, c.i.f. U.K. ports, duty free.

ACID BORACIC.—Crystal or granulated, £50 per ton. Powdered £52 per ton, carriage paid U.K. stations, minimum ton lots.

ACID CARBOLIC, ICE CRYSTALS.—Quoted 1s. 2d. per lb. delivered.

ACID CITRIC.—Spot lots, about 1s. 8d. per lb., but little demand.

ACID FORMIC, 80%.—Unchanged at £50 per ton, ex wharf, spot delivery.

ACID HYDROCHLORIC.—Makers' price unchanged. 6s. 6d. per carboy, ex works.

ACID NITRIC 80°.—£24 per ton, ex station, full truck loads.

ACID OXALIC.—Quoted 6d. per lb., ex store.

ACID SULPHURIC.—114°, £3 15s. per ton. 168°, £7 per ton, ex works, full truck loads. Dearsenicated quality, 20s. per ton extra.

ACID TARTARIC.—Unchanged at 1s. 2¾d. per lb., less 5%, ex store, spot delivery.

ALUM, LUMP POTASH.—Spot lots about £11 5s. per ton, ex store.

ALUM, CHROME.—Offered at £22 to £23 per ton, according to quality, f.o.b. U.K. ports.

ALUMINA SULPHATE.—17/18%, £10 10s. per ton. 14/15%, £7 10s. per ton, ex wharf, early delivery.

AMMONIA, ANHYDROUS.—Unchanged at 1s. 5d. per lb., ex station.

AMMONIA, CARBONATE.—Lump 4d. per lb. Ground, 4½d. per lb. delivered.

AMMONIA, LIQUID, 880°.—About 3½d. per lb., ex station.

AMMONIA MURIATE.—Grey Galvanisers quality, about £30 to £31 per ton. Fine white crystals, £23 15s. per ton, ex wharf, early delivery.

AMMONIA SULPHATE.—25¼%, £13 2s. per ton. 25¾% neutral quality, £14 5s. per ton, ex works, prompt delivery.

ARSENIC, WHITE POWDERED.—Inclined to be higher at £76 to £76 10s. per ton, ex wharf.

BARIUM CHLORIDE.—98/100%. Unchanged at £13 5s. per ton, ex wharf, early delivery.

BARYTES.—Finest white English, £5 5s. per ton, ex works.

BLEACHING POWDER.—£11 7s. 6d. per ton, ex station, spot delivery. Contracts 20s. per ton less.

BORAX.—Granulated £26 10s. per ton. Crystal £27 per ton. Powdered £28 per ton, carriage paid U.K. stations, minimum ton lots.

CALCIUM CHLORIDE.—English make unchanged at £5 12s. 6d. per ton, ex quay or station. Continental material about £4 per ton c.i.f. U.K.

COPPER SULPHATE.—Moderate export enquiry. Quoted £26 10s. per ton, less 5%, f.o.b. U.K. port.

COPPERAS, GREEN.—About £2 2s. 6d. per ton, f.o.b. U.K. port.

FORMALDEHYDE, 40%.—Quoted £92 10s. per ton, ex wharf, spot delivery. About £87 per ton, ex wharf, early shipment from Continent.

GLAUBER SALTS.—Fine white crystals quoted £3 15s. per ton, ex store.

LEAD, RED.—English makers reduce price to £40 per ton, carriage paid U.K. stations. Continental material about £36 10s. per ton, ex store.

LEAD ACETATE.—Spot material scarce. Offered from Continent at £42 per ton, c.i.f. U.K., prompt shipment.

MAGNESITE, GROUND CALCINED.—English burnt material, £8 5s. per ton, ex station. Finest Continental, about £7 5s. per ton c.i.f. U.K. ports.

MAGNESIUM CHLORIDE.—Slightly higher at 32s. 6d. per ton, c.i.f. U.K. Spot lots about £2 15s. per ton, ex store.

MAGNESIUM SULPHATE (Epsom Salts).—Commercial quality £7 per ton. B.P. quality, £8 5s. per ton, ex station. Continental commercial crystals quoted £4 per ton ex store.

POTASSIUM BICHROMATE.—Unchanged at 5⅝d. per lb., delivered.

POTASSIUM CARBONATE.—96/98%. Now quoted £29 15s. per ton, c.i.f. U.K. 90/92%, about £27 per ton. Spot lots £32 10s. and £28 per ton respectively, ex store.

POTASSIUM, CAUSTIC.—88/92%. Spot lots now quoted about £33 per ton ex store.

POTASSIUM CHLORATE.—Unchanged at about 3d. per lb. ex store.

POTASSIUM NITRATE (Saltpetre).—Nominally £32 per ton, ex store.

POTASSIUM PERMANGANATE.—B.P. Crystals unchanged at about 10½d. per lb. ex store.

POTASSIUM PRUSSIATE.—Yellow. Now offered at 1s. 3½d. per lb., but little demand.

SODA CAUSTIC.—76/77%, £21 7s. 6d. per ton. 70/72%, £19 17s. 6d. per ton. 60/62% broken, £21 2s. 6d. per ton. 98/99% powdered, £24 15s. per ton. All ex station, spot delivery.

SODIUM ACETATE.—Inclined to be higher at £25 10s. per ton, ex wharf.

SODIUM BICARBONATE.—Refined recystallised quality, £10 10s. per ton, ex quay or station. M.W. quality, 30s. per ton less.

SODIUM BICHROMATE.—Unchanged at 4½d. per lb., delivered.

SODIUM CARBONATE (Soda Crystals).—£5 to £5 5s. per ton, ex quay or station. Alkali 58%, £8 16s. per ton, ex quay or station.

SODIUM HYPOSULPHITE.—Commercial crystals offered from the Continent at £7 17s. 6d. per ton, c.i.f. U.K. Spot lots about £9 10s. per ton, ex store. Pea crystals quoted £15 10s. per ton. ex store.

SODIUM NITRATE.—Refined 96/98% about £13 7s. 6d. per ton, f.o.r. or f.o.b. U.K. port.

SODIUM NITRITE.—£27 to £29 per ton, basis 100%, according to quantity.

SODIUM PRUSSIATE (Yellow).—Price about 7d. per lb., but could probably be obtained at a fraction less.

SODIUM SULPHATE (Saltcake).—Unchanged at £4 per ton, ex station, for home consumption. Higher prices for export.

SODIUM SULPHIDE.—60/62%. Continental material about £12 10s., per ton, c.i.f. U.K. British quoted £16 10s. per ton, ex station.

SULPHUR.—Flowers, £10 per ton. Roll, £9 per ton. Rock, £9 per ton. Ground, £8 per ton. Prices nominal.

TIN CRYSTALS.—Unchanged at 1s. 4d. per lb.

ZINC CHLORIDE.—98/100% solid. Quoted £22 15s. per ton, c.i.f. U.K. ports.

ZINC SULPHATE.—Commercial crystals about £11 5s. per ton, ex store.

NOTE.—The above prices are for bulk business, and are not to be taken as applicable to small parcels.

Coal Tar Intermediates, Etc.

ALPHA NAPHTHYLAMINE.—Large export inquiries. Price 1s. 6½d. per lb. delivered.

BENZIDINE BASE.—Large export inquiry. Price quoted 4s. 10d. per lb., 100% basis.

BETA NAPHTHYLAMINE SULPHATE.—Supplies are offered at 3s. 0½d. per lb. delivered, for large quantities.

DIPHENYLAMINE.—Export inquiry. Price quoted 3s. 6d. per lb. f.o.b. U.K. port.

METHYL ALCOHOL PURE, CONTAINING LESS THAN ·1% ACETONE.—Price inclined to be weaker and supplies are more freely available.

MIRBANE OIL.—Price 8d. per lb. delivered, drums extra, returnable.

NAPHTHIONATE OF SODA.—Several home inquiries. Price 2s. 8½d. per lb. 100% basis.

ORTHO TOLUIDINE.—Supplies are offered at 11d. per lb. f.o.b. U.K. port, drums included.

PARADICHLORBENZOL is offered at 10½d. per lb. delivered.

SOLVENT NAPHTHA 90% at 160°.—Market weak. Price 1s. 5d. to 1s. 6d. per gallon.

XYLOL, PURE.—Market inclined to be weaker. Present price 2s. 3d. per gallon.

How to Handle Dangerous Chemicals

INVESTIGATIONS conducted by the Department of the Interior through the Bureau of Mines relative to the hazards involved in the handling and testing explosives is relatively low; in fact, it is lower than in some supposedly less dangerous occupations. Workers who handle explosives, being aware of the danger, practice carefulness until it becomes a habit. Any feeling of nervousness by a man engaged in handling explosives is highly dangerous, as it may result in his dropping a batch of sensitive material or knocking over a piece of apparatus. Men subject to nervousness should overcome it or withdraw from the industry. All explosives should be treated with proper respect, but it is not necessary to feel that the slightest jar will be disastrous. The U.S.A. Bureau of Mines estimates that at least 75 per cent. of all the industrial accidents with explosives are caused by hurrying the work and by taking chances where conditions are known to be dangerous; probably 20 per cent. are due to carelessness, the rest having fairly excusable causes. The great essential in avoiding accidents is that inexperienced men should be made fully conscious of every movement in handling explosives and should be trained to "play safe" until they are automatically careful all the time. Nearly all men become accustomed to working with explosives and feel no nervous strain, although after a bad explosion only a person of unimaginative temperament can work without excessive nerve fatigue. In the laboratory a chemist naturally avoids spattering or spilling materials on his clothes or skin, or inhaling the fumes or fine particles of any explosive. Benzene, toluene, aniline, and their nitro compounds, besides other compounds, are known to be poisonous, but so is hydrogen sulphide, which all chemists use. When preparing samples of explosives many analysts wear rubber gloves, but the usual course is to see that the hands are dry, to avoid direct contact as much as possible, and to wash the hands as soon as the sampling is finished. When possible, it is best to bathe the hands in a dilute solution of sodium sulphite, which acts as a solvent and is not readily absorbed by the skin. When a sample contains, or is likely to contain, hexanitrodiphenylamine, special precautions should be used, as comparatively small quantities of it cause blisters and burns the skin, and dust from it causes severe injury to the mucous membranes of the eyes, nose and throat.

An International Pharmacopœia

AT the annual congress of the International Pharmaceutical Federation which opened in London on Monday, the president (Professor Van Itallie, of Amsterdam) referred to the question of an international pharmacopœia. There was, he said, no other question of so great importance to all pharmacists as the compilation and contents of such a book. A wish for its attainment had been repeated again and again. In the present day, in face of the increasing traffic between the nations, the lack of an international pharmacopœia was an anachronism. In compiling such a book limitation was necessary. By a committee, composed of chemists, pharmacologists, clinicists, and sesologists, a book of restricted size could be compiled that would be the standard pharmacopœia for all countries. The congress also discussed the question of an international secretariat, and decided to issue a monthly international bulletin stating the laws and regulations made in each country affecting pharmacy.

Manchester Chemical Market

(FROM OUR OWN CORRESPONDENT.)

Manchester, July 26, 1923.

The Lancashire cotton trade, the American section in particular, is still the weak spot in the chemical market here, although apart from this home consumers generally are pursuing a very cautious buying policy, hand-to-mouth operations being the rule, with forward business of small dimensions. Foreign business, also, is very quiet, caustic soda, bleaching powder, alkali, and saltcake being the chief exceptions.

Heavy Chemicals

Sodium sulphide is still quiet on home consumption account, though there is a quietly steady demand for export; prices are steady at £14 10s. to £15 per ton for 60 to 65 per cent. concentrated solid and £8 10s. per ton for crystals. The demand for caustic soda, both for home and foreign consumers, is keeping up, and prices are unchanged from last week at from £19 for 60 per cent. to £21 10s. per ton for 76 to 77 per cent. material. Bleaching powder is steady and in fair inquiry at £11 7s. 6d. per ton to home users. Soda crystals are firm at £5 5s. per ton delivered, with a moderate amount of business being put through. Glauber salts are inactive at round £4 per ton. Bicarbonate of soda is unchanged at £10 10s. per ton delivered to home users. Saltcake is steady at £4 10s. per ton, the home demand being dull, though export inquiry is good. Alkali is firm and in fairly active demand, both for home consumers and for shipment, at £7 12s. 6d. per ton for 58 per cent. material. Hyposulphite of soda is quiet but steady at £14 per ton for photographic crystals and £10 for commercial. Nitrite of soda is firm and still rather scarce at £26 10s. to £27 per ton. Phosphate of soda continues inactive, and prices are on the easy side at £14 10s. per ton. Chlorate of soda is steady and in fair demand at 2¾d. per lb. Prussiate of soda is very quiet, though the price is still round 6¾d. per lb. Bichromate of soda is steady and in moderate inquiry at 4½d. per lb. Acetate of soda is firm at about £25 per ton, with supplies short for early delivery.

Caustic potash is quoted at £29 per ton for 88-90 per cent. material, a fair amount of business being done. Carbonate of potash is rather quiet at £31 per ton for 96-98 per cent. and £28 for 90-92 per cent. Bichromate of potash is steady and in moderate inquiry at 5¾d. per lb. Yellow prussiate of potash is still a very inactive section at 1s. 3d. per lb. Permanganate of potash is quiet but steady at 9¾d. per lb. Chlorate of potash is firm and in fair demand at 3d. per lb.

Sulphate of copper receives only a moderate amount of attention, though prices are unchanged at £26 to £26 10s. per ton. Arsenic is quieter, but price is fully maintained at £73 to £74 per ton for white powdered, Cornish makes. Commercial Epsom salts are in fair inquiry at £4 to £4 10s. per ton; magnesium sulphate, B.P., is quoted at about £6. Acetate of lime continues scarce for early delivery, with prices firm at £21 for grey and £11 10s. per ton for brown. Nitrate of lead is quiet but steady at £42 per ton. Sugar of lead is firm at £42 per ton for white and brown, supplies not being excessive.

Acids and Tar Products

Tartaric acid is quiet and perhaps a shade easier at 1s. 3d. to 1s. 3½d. per lb. Citric acid, B.P. crystals, is unchanged at 1s. 8d. to 1s. 8½d. per lb. Acetic acid is in steady inquiry at £70 per ton for glacial and £48 per ton for 80 per cent. technical. Oxalic acid is inactive, though the price is maintained at round 6d. per lb.

Pitch is still the subject of inquiry for export at the opening of the season, and prices are very firm at about £7 per ton f.o.b. Most of the other coal products are finding a very slow market. Carbolic acid is quiet at 1s. 2d. per lb. for crystals and 3s. per gallon for crude. Benzol is unchanged at 1s. 7d. to 1s. 8d. per gallon. Naphthalenes are steady at £20 for flake and £7 to £13 per ton for crude, according to quality, but the demand is rather subdued. Creosote oil is meeting with only a moderate demand at 8¾d. to 9d. per gallon. Solvent naphtha is maintained at last week's range of 1s. 5½d. to 1s. 6d. per gallon, though little improvement can be reported.

Company News

British Cellulose and Chemical Manufacturing Co., Ltd.—The directors state that they anticipate holding the next annual general meeting early in September.

United Alkali Co., Ltd.—The dir ctors announce a dividend at the rate of 7% p r annum on th pref rence shar s, and 4% on the ordinary shar s, l ss tax at 4/7½, payable on August 30.

Major and Co.—The profit for the year 1922 amounted to £30,403, against £25,761 for the previous year, and £2,140 was brought forward, making a total of £32,543. It is proposed to pay a final dividend of 4½ per cent. on the preferred ordinary shares, making 8 per cent. for the year, and a dividend of 10 per cent. on the ordinary shares. A sum of £2,443 is carried forward.

Forth Glass Works.—The accounts for the year to March 31, 1923, show that after deduction of £597 for depreciation, there is a loss of £2,623, which, with the debit balance of £4,819 brought forward from the previous year, leaves a balance at debit of profit and loss account of £7,442. The report states that trading conditions continued to be unsatisfactory, and the works were on short time throughout the year. A fire took place at the works in January last, and a considerable amount of damage was done. Payment of company's claim as adjusted was received after close of the year's accounts.

Van den Berghs, Ltd.—The net profit for the year 1922, including profits and losses of subsidiary companies, dividends of associated companies, and income from investments, amounted to £346,842, to which is added £106,964 brought forward, making a total of £453,806. After deducting all preference and preferred ordinary dividends to the end of the year, the directors propose a dividend of 2s. 6d. per share, or 50 per cent., for the year on the ordinary shares (of which 1s. per share has already been paid), leaving a balance to be carried forward of £108,327. The ordinary general meeting will be held at Winchester House, London, on July 31, at 11.30 a.m.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

Locality of Firm or Agent.	Material.	Ref. No.
Santo Domingo	Cement	D.O.T. 8190/FL/MC/2
Belgium ..	Tanning extracts and other products used in the manufacture of leather	—

Tariff Changes

Canada.—Certain classes of firebrick will now be free of import duty.

Union of South Africa.—A number of chemical products have recently been added to the duty free list if produced in Britain. It is proposed to reduce the import duty on turpentine and salt if intended for certain industrial purposes. All calcium carbide imported must be up to a definite standard.

Contracts Open

Tenders are invited for the following articles. The latest dates for receiving tenders are, when available, given in parentheses:

South Africa (August 27).—Aluminium paint. Particulars from the Department of Overseas Trade, 35, Old Queen Street, London, S.W. 1. Reference No., 11,706/ED/CC 2.

Oil Expert's Failure

The first meeting of the creditors of an oil expert bearing the name of William Ewart Gladstone Hudson-Hobden, Walton-on-Thames, Surrey, was held on Friday, July 20, in London. The statement of affairs showed liabilities of £3,814 13s. 1d., and a deficiency of £3,388 13s. 1d. The debtor attributed his failure to non-fulfilment of service agreement, in the terms of which he was to receive shares of the value of £20,000; heavy rates of interest on moneys borrowed, law costs of proceedings against him, and losses by betting. From 1918 to June, 1920, he was employed as an oil production expert in America, and from that date to September, 1922, was employed as foreign representative and then as a director of an oil company carrying on business in this country and Mexico. The company undertook in May, 1921, to allot fully paid shares to him, which were now of a value of £20,000, but later the company refused to issue the shares on various grounds, and he was unable to enforce completion of the contract owing to lack of funds. In September, 1922, he became technical adviser to a syndicate for the purpose of floating a petrol distributing company, in which event he was to benefit considerably, but the company was never formed. When he left America in 1920 he was worth about £15,000, of which about £10,000 represented the value of certain oil and gas leases in Kansas, which were forfeited early in 1922. The remainder of his capital was expended by him in a visit to Mexico for the purpose of obtaining an oil pipe line concession. He had recourse to moneylenders in July, 1922, and had since obtained further loans at high rates of interest. The creditors decided to appoint Mr. F. S. Saleman, of 1 and 2, Bucklersbury, as trustee.

Sulphate Prices for Japan

An Osaka correspondent states that the Brunner-Mond Co. who are described as large suppliers of sulphate of ammonia to Japan, have announced their selling price for September shipment from England at Y176 per ton, c.i.f. Japan ports. This has produced a stir in the Japanese fertiliser market, on which both British and American sulphate of ammonia has been quoted in the neighbourhood of Y215. The inference drawn in Japan from this reduction in price is that there has been a world-wide over-production of this material. Germany, for example, has made such a remarkable development in this industry that she is able to quote Japan Y167 to Y168 for her sulphate of ammonia, to be shipped in February-March, 1924. If a result of the all-round increase in production is to be a price-diminution in the future, then England is considered to have acted wisely. Under these conditions, it is most risky to make speculative purchases of large quantities, but rumour has it that in Kobe distant contracts have been made with America for 20,000 to 30,000 tons, for shipment during the second half of this year.

Photographic Materials for Brazil

H.M. Consul at Porto Alegre, Brazil (Mr. T. C. Dillon) has transmitted to the Department of Overseas Trade a report on the market for photographic materials in the State of Rio Grande de Sul, a copy of which may be obtained by British firms upon application to the Department, 35, Old Queen Street, London, S.W.1. (Ref.: 905/5/FG/CC/2).

Sulphate of Ammonia for Hong Kong

A firm of Hong Kong importers are desirous of getting into touch with United Kingdom exporters of sulphate of ammonia. Applications for further particulars regarding this inquiry should be addressed to the Department of Overseas Trade, 35, Old Queen Street, London, S.W. 1, quoting reference 11121/F.E/C.C.

Recent Wills

Mr. Samuel Lloyd Stacey, Fellows Road, South Hampstead, of Corbyn, Stacey and Co., Ltd., manufacturing chemists £4,149

Mr. Thomas Illingworth, of Ellerslie, Uffington Road, Harlesden, London, photographic paper manufacturer £157,407

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

County Court Judgments

[*NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.*]

AUCHINACHIE, Peter, Essex Villa, Tavistock Road, South Woodford, consulting chemist. (C.C., 28/7/23.) £10 9s. 7d. June 7.

COPE, Matthew, 20, Cornwall Road, Harrow, chemical manufacturer. (C.C., 28/7/23.) £30 17s. 8d. June 11.

Deed of Arrangement

POWELL, Frederick William, 85, Blackfriars Road, S.E., and 24, East Sheen Avenue, Mortlake, chemical merchant. (D.A., 28/7/23.) Assignment upon trust, etc., with a view to payment of a composition of 7s. 6d. in the £, trustee to accept an offer received from Thomas Powell, Ltd., for sale to the company of the assets and goodwill for £1,180 7s. 8d., payable £150 on signing contract for sale, £530 7s. 8d. at three months, and £500 at six months from date hereof, and to realise the remaining property and pay aforesaid composition by instalments, viz.: 2s. on execution hereof by all creditors, 2s. 6d. within three months, and 3s. within six months from date hereof. Trustee, S. F. Rattenbury, 84, Chancery Lane, W.C., C.A. Secured creditors, £1,506; liabilities unsecured, £5,765; assets, less secured claims, £2,007. The following are creditors:—Bankers, £275; Stafford, Allen, and Sons, Ltd., £69; Anglo-Continental and Colonial Traders, Ltd., £105; Ansay, R., £58; Annison, H. E., £1,829; Aron, E., £57; A. Boake Roberts and Co., Ltd., £58; British Cellulose and Chemical Manufacturing Co., Ltd., £248; Brown and Forth, Ltd., £59; Clayton Aniline Co., Ltd., £606; Greeff, R. W., and Co., Ltd., £391; Hirsch, O., £80; Johnson and Sons, Ltd., £309; Pink, E. and T., Ltd., £250; Perry and Hope, Ltd., £139; Rubeck, H., £79; Laurent, Mrs., Brighton, £240; Holliday, L. B., and Co., Ltd., Deighton, £120.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

IDEAL CLEANERS AND DYERS, LTD., London, W. (M., 28/7/23.) Registered July 12, £5,000 debentures (filed under sec. 93 (3) of the Companies (Consolidation) Act 1908), present issue, £2,000; general charge (subject to 1st debenture). *——. July 31st, 1922.

PASTEX DYES, LTD., London, N. (M., 28/7/23.) Registered July 13, £600 debenture, to Central and Western Corporation, Ltd., Fitzalan House, Arundel Street, W.C.; general charge. *£1,654 10s. December 29, 1922.

YOUNG (JOHN) (OF RADCLIFFE), LTD., finishers and dyers. (M., 28/7/23.) Registered July 9, £120,000 debenture, to Belgrave Mills Co., Ltd., Honeywell Lane, Oldham; general charge. *£21,000. July 17, 1922.

Satisfaction

PASTEX DYES, LTD., London, N. (M.S., 28/7/23.) Satisfaction registered July 16, £1,500, registered March 15, 1923.

London Gazette

Company Winding Up

HERCULIN GLUE AND COMPOUNDS CO., LTD. (C.W.U., 28/7/23.) First and final dividend of 3s. 1¾d. per £, payable August 3, at the Office of the Official Receiver and liquidator, 29, Russell Square, London, W.C.1.

Company Winding Up Voluntarily

DEGREASING CO., LTD. (C.W.U.V., 28/7/23.) W. H. Shaw, Market Place, Dewsbury, chartered accountant, appointed liquidator. Meeting of creditors at the offices of Messrs. W. H. Shaw and Sons, Market Place, Dewsbury, on Wednesday, August 8, 3 p.m.

Edinburgh Gazette

HARKNESS, GALLACHER AND RUFF, LTD. (C.W.U.V., E.G., 28/7/23.) Hugh M. Mackie, C.A., Glasgow, appointed liquidator. Meeting of creditors at the liquidator's office, 124, St. Vincent Street, Glasgow, on Wednesday, August 8, at 12 noon.

New Companies Registered

BARONS, LTD., Derby Street, Cheetham, Manchester. Manufacturing, consulting, pharmaceutical and general chemists, etc. Nominal capital, £1,000 in £1 shares.

BIRMINGHAM RUBBER AND CHEMICAL CO., LTD., 23, Whittall Street, Birmingham. Manufacturers of and dealers in rubber and chemical compounds, cements, oils, paints, pigments, chlorides, carbons, etc. Nominal capital, £1,000 in £1 shares.

HOLLOWAYS, LTD., 12, Wolverhampton Street, Dudley. Chemists, druggists, drysalters, oil and colourmen, etc. Nominal capital, £500 in £1 shares.

MALTBY'S MORPOWR CO., LTD. Manufacturers of polishes and soaps, oil refiners, distillers and manufacturers, chemists, druggists, drysalters, oil and colour merchants, etc. Nominal capital, £1,000 in £1 shares. A director: J. H. Maltby, 77, High Street, Sandgate.

Chemistry in the Cotton Industry

MODERN industry has performed no wonders that verge more on the miraculous (says a writer in the *Manchester Guardian Commercial*) than are found in the protean variations of cotton when subjected to chemical processes. Probably the leading exponents in this branch of the industry are the Du Ponts at Wilmington, Delaware. In their manufacture of articles under the trade names of Fabrikoid and Pyralin products, they have given to consumers some remarkable substitutes for other raw materials such as ivory, rubber, leather, amber, tortoise-shell, and even copper and bronze. The widespread use to which soluble cotton is being put in industry is shown by a recent informal survey made by the Cellulose Products Company, one of the Du Pont concerns. Here we find a range from medicinal products to the making of artificial jewellery, and including a great number of trades. Soluble cotton, also known as pyroxylin, is manufactured by treating raw cotton with mixtures of sulphuric and nitric acids, after the raw fibre has been chemically purified. The cotton is then subjected to an extensive purification process in order to remove all traces of free acid, and to render the finished product neutral and stable. Cotton thus treated may then be used in making a coating for split leather hides for furniture or automobile upholstering, travelling bags, and novelties of all sorts. It is used for coating cotton goods, for making artificial leather, and also for making the higher grades of patent leather. Among the other uses found by the Du Ponts are the coating of fibre boards to make them waterproof and to give them a leather-like appearance, coating aeroplane wings to stretch the linen and make it waterproof, coating gas mantles to give them stability until they are adjusted on the gas fixtures, in making "canned heat," finger-nail polish, shoe polish, shoe-heel enamels, corn cures and waterproofing bandages, for cementing moving-picture films and celluloid, and many other uses.